PATENT ABSTRACTS OF JAPAN

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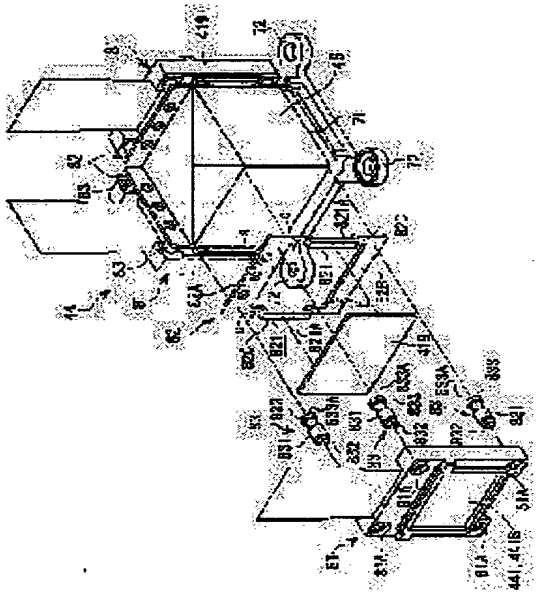
(54) OPTICAL COMPONENTS AND PROJECTOR PROVIDED WITH THE SAME

(57)Abstract:
PROBLEM TO BE SOLVED: To provide optical components which can be fixed surely to an optical modulator side and a prism side and minimizing prism size to an optically absolutely minimum size and a projector.
SOLUTION: A frame body 82 is attached to a cross dichroic prism 45, and a holding frame 81 for holding a liquid crystal panel 441 is attached to the frame body 82 via a fixing pin 83. Since the need of directly fixing the fixing pin 83 to the cross dichroic prism 45 is eliminated, the cross dichroic prism 45 of the optically absolute minimum size can be used. Also, since the fixing pin 83 is fixed to the frame body 82 and the fixing area with the fixing pin of the frame body 82 is taken to be large, fure fixing strength for the fixing pin 83 and the frame body 82 is obtained, and the liquid crystal panel 441 can be fixed surely to the side of the cross dichroic prism 45.



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CLAIMS

[Claim(s)]
[Claim 1] The optic characterized by being the optic equipped with light modulation equipment, the maintenance frame holding this light modulation equipment, prism, and the lock-pin for fixing said maintenance frame to said prism, and having the frame attached in the field of said prism, and fixing the end side of said lock-pin to said maintenance frame, and fixing the other end side to said frame.
[Claim 2] The periphery configuration of said frame is an optic characterized by being formed more greatly than the field of said prism in which the frame concerned is attached in an optic according to claim 1.
[Claim 3] It is the optic characterized by forming said maintenance frame with synthetic resin, forming said prism with optical glass in an optic according to claim 1 or 2, and forming said frame with the metal.
[Claim 4] The optic characterized by preparing the film mounting section for attaching an optical film in said frame in an optic according to claim 1 to 3.
[Claim 5] The optic characterized by forming the opening in an optic according to claim 4 between the clamp face of said film mounting section in which said optical film is attached, and the field of said prism in which said frame is attached.
[Claim 6] Said lock-pin is an optic characterized by to be the optic equipped with light modulation equipment, the maintenance frame holding this light modulation equipment, prism, and the lock-pin for fixing said maintenance frame to said prism, to fix an end side to said maintenance frame, to carry out adhesion immobilization of the other end side at said prism side, and to form more greatly than the cross section by the side of said end the cross section by the side of the other end of said lock-pin.
[Claim 7] The projector which is a projector which is equipped with the light modulation equipment which modulates two or more colored light according to image information, and the prism which compounds the light modulated with this light modulation equipment, carries out amplification projection of the light compounded by the prism concerned, and forms a projection image, and is characterized by having the optic according to claim 1 to 6.
[Claim 8] The projector characterized by having the power source energized to said light modulation equipment in a projector according to claim 7.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the projector equipped with an optic and this, and relates to an optic and a projector equipped with the lock-pin for fixing an electro-optic device, the maintenance frame holding this electro-optic device, prism, and a maintenance frame and prism in detail.
[0002]
[Description of the Prior Art] The environment which uses a projector is spreading and it is used by an in-house board, the presentation in a business trip place, etc. in recent years, and also by incorporating the data of CAD/CAM/CAE and carrying out amplification projection, it is used for the technical examination meeting in the research and development division etc., or the lesson of various seminars, study session, and the school that performs audiovisual education further is used. Moreover, medical images and data, such as CAT and MRI, are projected, and it uses for examination of a cure, medical instruction, etc., or is used also for directing effectively the event for which a show and large number of people gather.
[0003] Thus, in current [for which a projector is used in a certain **** environment], the specification and function for which a projector is asked are also various, and has the high brightness model which pursued the lightweight compact model which pursued portability, and image quality and a high resolution model, the highly efficient model which enabled connection with each digital instrument or a mobile tool. And development of the projector of reliance high added value is briskly performed from the further amplification of the environment used being expected supposing a new operating environment.
[0004] By the way, as a projector which was mentioned above, the projector equipped with the electro-optic device which modulates two or more colored light according to image information, the cross dichroic prism which compounds the light modulated with the electro-optic device concerned, and the projection lens which carries out amplification projection of the light compounded with this cross dichroic prism is known conventionally.
[0005] In such a projector, while corresponding to a miniaturization, in order to attain simplification of structure, the structure which fixes to the side face of a cross dichroic prism three light modulation equipments (for example, liquid crystal panel) which constitute an electro-optic device through a holddown member is adopted. As such structure, there are some which are proposed by Japanese Patent Application No. No. (that for which these people applied) 25345 [11 to], and a hole is prepared in the four corners of the maintenance frame holding light modulation equipment, respectively, a lock-pin is inserted in this hole and it fixes to it, and this is carrying out adhesion immobilization of the head of a pin soon on the side face of a cross dichroic prism, and is fixing light modulation equipment to a cross dichroic prism.
[0006]
[Problem(s) to be Solved by the Invention] However, with structure which was mentioned above, since adhesion immobilization of the head of a pin is soon carried out on the side face of a direct cross dichroic prism, adhesion area with a lock-pin is needed for the side face of a cross dichroic prism, and there is a problem that only the part of this adhesion area must make a cross dichroic prism greatly. For this reason, the structure itself cannot make the cross dichroic prism itself small, even if it can simplify. That is, a cross dichroic prism cannot be optically made into necessary minimum magnitude. In order to make a cross dichroic prism small, it is possible to make adhesion area of a cross dichroic prism and a lock-pin into the minimum magnitude, but if adhesion area is made into the minimum, anxiety will arise in the bond strength of a cross dichroic prism and a lock-pin, as a result anxiety will arise about the fixed reinforcement of a cross dichroic prism and light modulation equipment.
[0007] The object of this invention is to offer the optic and projector which can make prism necessary minimum

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[0007] The object of this invention is to offer the optic and projector which can make prism necessary minimum

magnitude optically while certainly being able to fix a light modulation equipment and prism side.
[0008]
[Means for Solving the Problem] The optic of this invention is equipped with the following configurations in order to attain the above-mentioned object. Invention according to claim 1 is the optic equipped with light modulation equipment, the maintenance frame holding this light modulation equipment, prism, and the lock-pin for fixing said maintenance frame to said prism, and is characterized by having the frame attached in the field of said prism, and fixing the end side of said lock-pin to said maintenance frame, and fixing the other end side to said frame.
[0009] Since according to this invention a frame is attached in prism and the maintenance frame which holds light modulation equipment to this frame is attached through the lock-pin, it is not necessary to fix a lock-pin to direct prism and to secure the area for fixing a lock-pin to the prism itself. Thereby, the prism itself becomes small that prism should just have necessary minimum magnitude optically. Moreover, since a lock-pin is fixed to a frame, if large magnitude, width of face, etc. of a frame are taken, a large area for fixing a lock-pin can be taken not related in the magnitude of prism. For this reason, the fixed reinforcement of a lock-pin and a frame is fully obtained, and light modulation equipment is certainly fixed to a prism side.
[0010] Invention according to claim 2 is characterized by forming the periphery configuration of said frame more greatly than the field of said prism in which the frame concerned is attached in an optic according to claim 1. According to this invention, since the periphery configuration of a frame is formed more greatly than the field of prism, a large area for fixing a lock-pin regardless of the magnitude of prism can be taken, without hardly covering the field of prism with a frame. Thereby, a lock-pin, i.e., light modulation equipment, is certainly fixed to a prism side.
[0011] It is characterized by forming said maintenance frame for invention according to claim 3 with synthetic resin in an optic according to claim 1 or 2, forming said prism with optical glass, and forming said frame with the metal. Since the maintenance frame made of synthetic resin generally used, for example to optical instruments, such as a projector, and the prism made from optical glass are used according to this invention, it can constitute economically. Moreover, since a frame is metal, if a sheet metal etc. is used, it will be easy to form a frame in a desired configuration. Furthermore, when an optic is used for a projector, a maintenance frame, prism, etc. may expand with the heat generated from the light source etc. Usually, a maintenance frame is a product made from plastics in many cases, and its coefficient of thermal expansion is higher than the prism made from optical glass. For this reason, in the conventional optic, at the time of the activity of a projector, a maintenance frame expands thermally more greatly than prism, and there is a possibility that a gap may arise in the relative position of a maintenance frame and prism, i.e., the relative position of light modulation equipment and prism. Since coefficient of thermal expansion has connected the maintenance frame made of synthetic resin, and the prism made from optical glass in this invention through the metal frame which it is between synthetic resin and glass, even if heat arises, for example at the time of a projector activity, it is cushion ON ******** to the difference of the thermal expansion of prism and a maintenance frame with a frame. Thereby, a gap of the relative position by the differential thermal expansion of a maintenance frame and prism is controlled.
[0012] Invention according to claim 4 is characterized by preparing the film mounting section for attaching an optical film in said frame in an optic according to claim 1 to 3. According to this invention, since the film mounting section is prepared in the frame, the installation to the frame of an optical film becomes easy. Here, as an optical film, a phase contrast plate, a polarizing plate, a wide-field-of-view angle film, etc. are mentioned, for example.
[0013] Invention according to claim 5 is characterized by forming the opening between the clamp face of said film mounting section in which said optical film is attached, and the field of said prism in which said frame is attached in an optic according to claim 4. According to this invention, since the opening is formed, between the clamp face of the film mounting section of a frame, and the field of prism, an optical film is opened from prism, predetermined spacing can be installed, and the permeability between an optical film and prism can be kept good in it.
[0014] The maintenance frame with which invention according to claim 6 holds light modulation equipment and this light modulation equipment, It is the optic equipped with prism and the lock-pin for fixing said maintenance frame to said prism. Said lock-pin An end side is fixed to said maintenance frame, adhesion immobilization of the other end side is carried out at said prism side, and the cross section by the side of the other end of said lock-pin is characterized by being formed more greatly than the cross section by the side of said end.
[0015] According to this invention, the cross section by the side of the other end of the lock-pin by which adhesion immobilization is carried out is greatly formed in the prism side. That is, since the end face by the side of the other end of the lock-pin used as an adhesion side is formed greatly, the bond strength by the side of a lock-pin and prism is more fully secured. Here, direct adhesion immobilization may be carried out at prism, adhesion immobilization may be carried out at the frame concerning invention according to claim 1 to 5 which was mentioned above, and, in short,

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adhesion immobilization of the other end side of a lock-pin should just be carried out a prism side.
[0016] On the other hand, the projector of this invention is equipped with the following configurations in order to attain the above-mentioned object. Invention according to claim 7 is a projector which is equipped with the light modulation equipment which modulates two or more colored light according to image information, and the prism which compounds the light modulated with this light modulation equipment, carries out amplification projection of the light compounded by the prism concerned, and forms a projection image, and is characterized by having the optic according to claim 1 to 6. According to this invention, with constituting a projector using an optic according to claim 1 to 6, while fully being able to obtain the bond strength of prism and a lock-pin, the projector which can miniaturize prism is obtained, as a result the miniaturization of a projector is attained.
[0017] Invention according to claim 8 is characterized by having the power source energized to said light modulation equipment in a projector according to claim 7. Since the power source energized to light modulation equipment is prepared in the projector according to this invention, the electrical and electric equipment can be easily supplied to light modulation equipment.
[0018]
[Embodiment of the Invention] Hereafter, 1 operation gestalt of this invention is explained based on a drawing.
The [main configurations of 1. projector] The whole perspective view as which the whole perspective view which looked at the projector 1 which drawing 1 requires for this operation gestalt from the upper part, and drawing 2 regarded the projector 1 from the lower part, and drawing 3 are the perspective views showing the interior of a projector 1. The projector 1 is equipped with the abbreviation rectangular-head box-like sheathing case 2, the power supply unit 3 held in the sheathing case 2, and the optical unit 4 of the flat-surface L typeface similarly arranged in the sheathing case 2 in drawing 1 thru/or drawing 3 .
[0019] The sheathing case 2 consists of an upper case 21 made of synthetic resin by which a screw stop is carried out, metal lower cases 22, such as aluminum, and same metal front cases 23, such as aluminum, as shown in drawing 4 .
[0020] An upper case 21 is the configuration in which the top-face section 211 and the tooth-back section 212 were really fabricated. The porous 1st electromagnetic-shielding member 213 by punching processing of an aluminum plate is formed in the interior side of the top-face section 211 dismountable. The 2nd electromagnetic-shielding member 214 which is from an aluminum plate also on the interior side of the tooth-back section 212 of an upper case 21 is formed. The screw stop of the 2nd electromagnetic-shielding member 214 is carried out to the lower case 22 side.
[0021] The base section 221 and the lateral portion 222 of a couple which counters each other are the configurations formed in one, and the lower case 22 is carrying out bending of the aluminum plate of a predetermined configuration processed in the press, the machining center, etc., and the base section 221 and a lateral portion 222 bend each other, and it is formed.
[0022] The height positioning device 7 in which adjust the inclination of the projector 1 whole and alignment of a projection image is performed is formed in a part for both corners ahead of the base section 221. On the other hand, it is only that the foot member 6 (drawing 2) made of resin has fitted into the back side center section of the base section 221.
[0023] The front case 23 is a member which forms the front section 231 of the sheathing case 2, and is formed of bending or spinning of a predetermined configuration which were processed too in the press, the machining center, etc., such as an aluminum plate. this -- Corresponding to the projection lens 46, the round hole opening 232 is formed in the front case 23, and the circumference of the round hole opening 232 is curving to the interior side by spinning.
[0024] The hole 2G grade of a large number corresponding to control-panel 2F besides exhaust-port 2D for discharging cooling air and 2E and the location of a loudspeaker is prepared in the interior at such a sheathing case 2 from inlet-port 2A for taking in cooling air, 2B, 2C, and the interior. Moreover, the various connectors for an interface are exposed to the tooth-back side of the sheathing case 2, and the driver board and other boards on which each connector is mounted are supported by the aluminum plate 50 fixed so that a part for opening by the side of a tooth back might be closed. This aluminum plate 50 functions also as an electromagnetic-shielding plate.
[0025] The power supply unit 3 consists of a main power supply 31 as a power source arranged at the front-face side within the sheathing case 2 (drawing 3), and ballast 32 arranged behind a main power supply 31. A main power supply 31 supplies the power supplied through the power cable to ballast 32, the driver board which is not illustrated, and is equipped with the inlet connector 33 (drawing 2) in which said power cable is inserted, the frame 34 (drawing 3) surrounding a perimeter made from aluminum, the power circuit which is not illustrated. Moreover, the main power supply 31 is energized to the liquid crystal panel 441 later mentioned through the driver board which is not illustrated. Ballast 32 mainly supplies power to the light source lamp 411 (drawing 5) of the optical unit 4, and is equipped with the lamp actuation circuit.

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[0026] As shown in drawing 5 , the optical unit 4 is a unit which processes optically the flux of light by which outgoing radiation was carried out from the light source lamp 411, and forms the optical image corresponding to image information, and is equipped with the integrator illumination-light study system 41, the color separation optical system 42, the relay optical system 43, the electro-optic device 44, the cross dichroic prism 45 made from the optical glass as color composition optical system, and the projection lens 46 as projection optical system.

[0027] [Detailed configuration of 2. optical system] In drawing 5 , the integrator illumination-light study system 41 is the optical system for illuminating mostly the image formation field of the liquid crystal panel 441 (it is indicated as liquid crystal panels 441R, 441G, and 441B for every colored light) as light modulation equipment of three sheets which constitutes an electro-optic device 44 to homogeneity, and is equipped with light equipment 413, UV filter 418, the 1st lens array 414, the polarization sensing element 415, and the 2nd lens array 416.

[0028] The light equipment 413 which constitutes the integrator illumination-light study system 41 has the reflector 412 which reflects the synchrotron orbital radiation by which outgoing radiation was carried out from the light source lamp 411 and this light source lamp 411 as the radiation light source which carries out outgoing radiation of the beam of light of a radial. As a light source lamp 411, a halogen lamp, a metal halide lamp, or a high-pressure mercury lamp is used in many cases.

[0029] The 1st lens array 414 has the configuration with which small lens 414A which has a rectangle-like profile mostly was arranged in the shape of a matrix. Each smallness lens 414A is dividing into two or more partial flux of lights the flux of light which outgoing radiation is carried out from the light source lamp 411, and passes along UV filter 418. The profile configuration of each smallness lens 414A is set up so that an analog may be mostly made with the configuration of the image formation field of a liquid crystal panel 441. For example, if the aspect ratio (ratio of the dimension of width and length) of the image formation field of a liquid crystal panel 441 is 4:3, the aspect ratio of each smallness lens 414A will also be set as 4:3. The 2nd lens array 416 has the almost same configuration as the 1st lens array 414, and has the configuration with which small lens 416A was arranged in the shape of a matrix. This 2nd lens array 416 is condensing the light from the 1st lens array 414.

[0030] While the polarization sensing element 415 is arranged between the 1st lens array 414 and the 2nd lens array 416, the light from the 1st lens array 414 is changed into one kind of polarization light, and, thereby, the utilization effectiveness of the light in an electro-optic device 44 is raised. Concretely, each partial flux of light changed into one kind of polarization light condenses to a condenser lens 417, and is eventually superimposed mostly by the polarization sensing element 415 on the liquid crystal panels 441R and 441G of an electro-optic device 44, and 441B. since only one kind of polarization light of two kinds of polarization light (an S wave and P wave) which constitutes light from a projector 1 (electro-optic device 44) of this operation gestalt using the liquid crystal panel 441 of the type which modulates polarization light can be used -- the light from the light source lamp 411 -- one half is not used mostly. Then, by using the polarization sensing element 415, all the outgoing radiation light from the light source lamp 411 is changed into one kind of polarization light, and the utilization effectiveness of the light in an electro-optic device 44 is raised. In addition, such a polarization sensing element 415 is introduced to JP,8-304739,A.

[0031] The color separation optical system 42 is equipped with two dichroic mirrors 421,422 and the reflective mirrors 423, and has the function to divide into the colored light of three colors of red, green, and blue two or more partial flux of lights injected by dichroic mirrors 421 and 422 from the integrator illumination-light study system 41.

[0032] The relay optical system 43 is equipped with the incidence side lens 431, a relay lens 433, and the reflective mirrors 432 and 434, and has the function to draw the colored light separated by the color separation optical system 42, and blue glow to liquid crystal panel 441B.

[0033] An electro-optic device 44 is equipped with the liquid crystal panels 441R, 441G, and 441B of three sheets, and, as for these, the viewing-angle compensation film 419 as an optical film is arranged at the optical outgoing radiation side side of each liquid crystal panels 441R, 441G, and 441B, using poly-Si TFT as a switching element. With the liquid crystal panels 441R, 441G, and 441B of these three sheets, according to image information, it becomes irregular, and each colored light separated by the color separation optical system 42 forms an optical image.

[0034] The cross dichroic prism 45 compounds the image which was injected from the liquid crystal panels 441R, 441G, and 441B of three sheets and which was modulated for every colored light, and forms a color picture. Here, let the cross dichroic prism 45 be necessary minimum magnitude optically. The dielectric multilayer which reflects red light, and the dielectric multilayer which reflects blue glow are formed in the cross dichroic prism 45 in the shape of an abbreviation X character in accordance with the interface of four rectangular prisms, and three colored light is compounded by these dielectric multilayers. And the color picture compounded with the cross dichroic prism 45 is injected from the projection lens 46, and amplification projection is carried out on a screen. In addition, the optic of this invention is constituted including the electro-optic device 44 and the cross dichroic prism 45.

[0026] As shown in drawing 5 , the optical unit 4 is a unit which processes optically the flux of light by which outgoing radiation was carried out from the light source lamp 411, and forms the optical image corresponding to image information, and is equipped with the integrator illumination-light study system 41, the color separation optical system 42, the relay optical system 43, the electro-optic device 44, the cross dichroic prism 45 made from the optical glass as color composition optical system, and the projection lens 46 as projection optical system.

[0027] [Detailed configuration of 2. optical system] In drawing 5 , the integrator illumination-light study system 41 is the optical system for illuminating mostly the image formation field of the liquid crystal panel 441 (it is indicated as liquid crystal panels 441R, 441G, and 441B for every colored light) as light modulation equipment of three sheets which constitutes an electro-optic device 44 to homogeneity, and is equipped with light equipment 413, UV filter 418, the 1st lens array 414, the polarization sensing element 415, and the 2nd lens array 416.

[0028] The light equipment 413 which constitutes the integrator illumination-light study system 41 has the reflector 412 which reflects the synchrotron orbital radiation by which outgoing radiation was carried out from the light source lamp 411 and this light source lamp 411 as the radiation light source which carries out outgoing radiation of the beam of light of a radial. As a light source lamp 411, a halogen lamp, a metal halide lamp, or a high-pressure mercury lamp is used in many cases.

[0029] The 1st lens array 414 has the configuration with which small lens 414A which has a rectangle-like profile mostly was arranged in the shape of a matrix. Each smallness lens 414A is dividing into two or more partial flux of lights the flux of light which outgoing radiation is carried out from the light source lamp 411, and passes along UV filter 418. The profile configuration of each smallness lens 414A is set up so that an analog may be mostly made with the configuration of the image formation field of a liquid crystal panel 441. For example, if the aspect ratio (ratio of the dimension of width and length) of the image formation field of a liquid crystal panel 441 is 4:3, the aspect ratio of each smallness lens 414A will also be set as 4:3. The 2nd lens array 416 has the almost same configuration as the 1st lens array 414, and has the configuration with which small lens 416A was arranged in the shape of a matrix. This 2nd lens array 416 is condensing the light from the 1st lens array 414.

[0030] While the polarization sensing element 415 is arranged between the 1st lens array 414 and the 2nd lens array 416, the light from the 1st lens array 414 is changed into one kind of polarization light, and, thereby, the utilization effectiveness of the light in an electro-optic device 44 is raised. Concretely, each partial flux of light changed into one kind of polarization light condenses to a condenser lens 417, and is eventually superimposed mostly by the polarization sensing element 415 on the liquid crystal panels 441R and 441G of an electro-optic device 44, and 441B. since only one kind of polarization light of two kinds of polarization light (an S wave and P wave) which constitutes light from a projector 1 (electro-optic device 44) of this operation gestalt using the liquid crystal panel 441 of the type which modulates polarization light can be used -- the light from the light source lamp 411 -- one half is not used mostly. Then, by using the polarization sensing element 415, all the outgoing radiation light from the light source lamp 411 is changed into one kind of polarization light, and the utilization effectiveness of the light in an electro-optic device 44 is raised. In addition, such a polarization sensing element 415 is introduced to JP,8-304739,A.

[0031] The color separation optical system 42 is equipped with two dichroic mirrors 421,422 and the reflective mirrors 423, and has the function to divide into the colored light of three colors of red, green, and blue two or more partial flux of lights injected by dichroic mirrors 421 and 422 from the integrator illumination-light study system 41.

[0032] The relay optical system 43 is equipped with the incidence side lens 431, a relay lens 433, and the reflective mirrors 432 and 434, and has the function to draw the colored light separated by the color separation optical system 42, and blue glow to liquid crystal panel 441B.

[0033] An electro-optic device 44 is equipped with the liquid crystal panels 441R, 441G, and 441B of three sheets, and, as for these, the viewing-angle compensation film 419 as an optical film is arranged at the optical outgoing radiation side side of each liquid crystal panels 441R, 441G, and 441B, using poly-Si TFT as a switching element. With the liquid crystal panels 441R, 441G, and 441B of these three sheets, according to image information, it becomes irregular, and each colored light separated by the color separation optical system 42 forms an optical image.

[0034] The cross dichroic prism 45 compounds the image which was injected from the liquid crystal panels 441R, 441G, and 441B of three sheets and which was modulated for every colored light, and forms a color picture. Here, let the cross dichroic prism 45 be necessary minimum magnitude optically. The dielectric multilayer which reflects red light, and the dielectric multilayer which reflects blue glow are formed in the cross dichroic prism 45 in the shape of an abbreviation X character in accordance with the interface of four rectangular prisms, and three colored light is compounded by these dielectric multilayers. And the color picture compounded with the cross dichroic prism 45 is injected from the projection lens 46, and amplification projection is carried out on a screen. In addition, the optic of this invention is constituted including the electro-optic device 44 and the cross dichroic prism 45.

[0035] Each optical system 41-45 explained above is held in the light guide 47 made of synthetic resin, as shown in drawing 6 . namely, -- this light guide 47 -- light equipment 413 -- the above-mentioned besides the wrap light source protection section 471 -- each -- the slot which inserts optic 414-418,421-423,431-434 in a slide type from the upper part is prepared, respectively. Here, unitization of the polarization sensing element 415 and the 2nd lens array 416 is carried out to one, and they are inserted in the slot. And the covering 48 shown in drawing 3 is attached in the light guide 47. In addition, the installation to the light guide 47 of the electro-optic device 44 which is the optic of this invention, and the cross dichroic prism 45 is mentioned later.

[0036] Moreover, the cross dichroic prism 45 with which liquid crystal panels 441R, 441G, and 441B were attached in one is fixed to the end side of optical outgoing radiation side 49 of a light guide 47, and the projection lens 46 is fixed on the flange in alignment with a part for the semicircle tubed part by the side of the other end.

[0037] [3. cooling structure] In drawing 1 thru/or drawing 3 in a projector 1 The 1st cooling system A with which the cooling air attracted from inlet-port 2A of the projection lens 46 side and sheathing case 2 base is exhausted from exhaust-port 2D The 3rd cooling system C with which the cooling air attracted from inlet-port 2C prepared in the base of the 2nd cooling system B and the sheathing case 2 where the cooling air attracted from inlet-port 2B prepared in the side face of the sheathing case 2 is exhausted from exhaust-port 2E is exhausted from exhaust-port 2E is formed.

[0038] In the 1st cooling system A, the axial flow inhalation-of-air fan 51 (an alternate long and short dash line illustrates in drawing 3) is formed in the projection lens 46 side of a main power supply 31, and the 1st sirocco fan 52 is formed in the light equipment 413 side of ballast 32. Cooling a main power supply 31 and ballast 32, it flows and the cooling air attracted from the projection lens 46 side and inlet-port 2A by the axial flow inhalation-of-air fan 51 is attracted at a sirocco fan 52 side. The cooling air breathed out from the 1st sirocco fan 52 enters in the light source protection section 471 from notch 471for inhalation of air A prepared in the light guide 47, cools light equipment 413 from back, is exhausted from notch 471for exhaust air B (drawing 6), and is eventually exhausted out of the sheathing case 2 from exhaust-port 2D.

[0039] In the 2nd cooling system B, as shown in the sectional view of drawing 7 and drawing 8 , the 2nd sirocco fan 53 is formed in the projection lens 46 bottom. This 2nd sirocco fan 53 is arranged in the middle of the duct member 60 (drawing 6) which draws cooling air from inlet-port 2B to the lower part of an electro-optic device 44. After the inhalation of air attracted from inlet-port 2B is led to the duct member 60, is inhaled by the 2nd sirocco fan 53 and breathed out along the base of the sheathing case 2, it cools an electro-optic device 44. Cooling air is exhausted from exhaust-port 2E with this ventilating fan 54 next toward the axial flow ventilating fan 54 by the side of a tooth back, cooling the driver board which has been arranged in the upper part of the optical unit 4 and which is not illustrated.

[0040] In the 3rd cooling system C, as an alternate long and short dash line shows in drawing 6 , the 3rd sirocco fan 55 is formed in the location corresponding to inlet-port 2C of sheathing case 2 base in the underside of a light guide 47. The dust and dust which whose inlet-port 2C is making each hole into a minor diameter as much as possible, and are on the installation part of a projector 1 are made hard to absorb. The cooling air inhaled by the 3rd sirocco fan 55 from inlet-port 2C After being breathed out at the light equipment 413 side through the duct-like part formed between the base of the sheathing case 2, and the underside of a light guide 47, It is led to opening for inhalation of air (not shown) prepared corresponding to the location where the integrator illumination-light study system 41 of a light guide 47 has been arranged. UV filter 418 besides the unit which consists of the 1st lens array 414 which constitutes the integrator illumination-light study system 41, and which was mentioned above, and the polarization sensing element 415 and the 2nd lens array 416 is cooled toward the upper part from a lower part. Cooling air is exhausted from the openings 48A and 48B (drawing 3) for exhaust air of covering 48, and is eventually exhausted from exhaust-port 2E next with the axial flow ventilating fan 54 by the side of a tooth back.

[0041] [Structure of 4. optic] In the optic which consists of an electro-optic device 44 and a cross dichroic prism 45, as shown in drawing 6 and drawing 9 , an electro-optic device 44 is supported by the cross dichroic prism 45, and this cross dichroic prism 45 is attached in optical outgoing radiation side 49 (drawing 7) of a light guide 47 through the supporter material 70 which supports the cross dichroic prism 45 concerned. The supporter material 70 is equipped with the installation section 71 in which the cross dichroic prism 45 is laid, and four advice fixed parts 72 for guiding and fixing this installation section 71 to optical outgoing radiation side 49 of a light guide 47. From the installation section 71, the advice fixed part 72 projects to the side, and is prepared in it, and the cross dichroic prism 45 is attached in optical outgoing radiation side 49 of a light guide 47 by being fixed with the screw thread which this advice fixed part 72 and optical outgoing radiation side 49 of a light guide 47 do not illustrate.

[0042] As shown in drawing 9 and drawing 10 , the liquid crystal panels 441R, 441G, and 441B of three sheets which constitute an electro-optic device 44 are held by the maintenance frame 81 made of synthetic resin, and opposite arrangement is carried out with three side faces used as the optical plane of incidence of the cross dichroic prism 45. On

[0035] Each optical system 41-45 explained above is held in the light guide 47 made of synthetic resin, as shown in drawing 6 . namely, -- this light guide 47 -- light equipment 413 -- the above-mentioned besides the wrap light source protection section 471 -- each -- the slot which inserts optic 414-418,421-423,431-434 in a slide type from the upper part is prepared, respectively. Here, unitization of the polarization sensing element 415 and the 2nd lens array 416 is carried out to one, and they are inserted in the slot. And the covering 48 shown in drawing 3 is attached in the light guide 47. In addition, the installation to the light guide 47 of the electro-optic device 44 which is the optic of this invention, and the cross dichroic prism 45 is mentioned later.

[0036] Moreover, the cross dichroic prism 45 with which liquid crystal panels 441R, 441G, and 441B were attached in one is fixed to the end side of optical outgoing radiation side 49 of a light guide 47, and the projection lens 46 is fixed on the flange in alignment with a part for the semicircle tubed part by the side of the other end.

[0037] [3. cooling structure] In drawing 1 thru/or drawing 3 in a projector 1 The 1st cooling system A with which the cooling air attracted from inlet-port 2A of the projection lens 46 side and sheathing case 2 base is exhausted from exhaust-port 2D The 3rd cooling system C with which the cooling air attracted from inlet-port 2C prepared in the base of the 2nd cooling system B and the sheathing case 2 where the cooling air attracted from inlet-port 2B prepared in the side face of the sheathing case 2 is exhausted from exhaust-port 2E is exhausted from exhaust-port 2E is formed.

[0038] In the 1st cooling system A, the axial flow inhalation-of-air fan 51 (an alternate long and short dash line illustrates in drawing 3) is formed in the projection lens 46 side of a main power supply 31, and the 1st sirocco fan 52 is formed in the light equipment 413 side of ballast 32. Cooling a main power supply 31 and ballast 32, it flows and the cooling air attracted from the projection lens 46 side and inlet-port 2A by the axial flow inhalation-of-air fan 51 is attracted at a sirocco fan 52 side. The cooling air breathed out from the 1st sirocco fan 52 enters in the light source protection section 471 from notch 471for inhalation of air A prepared in the light guide 47, cools light equipment 413 from back, is exhausted from notch 471for exhaust air B (drawing 6), and is eventually exhausted out of the sheathing case 2 from exhaust-port 2D.

[0039] In the 2nd cooling system B, as shown in the sectional view of drawing 7 and drawing 8 , the 2nd sirocco fan 53 is formed in the projection lens 46 bottom. This 2nd sirocco fan 53 is arranged in the middle of the duct member 60 (drawing 6) which draws cooling air from inlet-port 2B to the lower part of an electro-optic device 44. After the inhalation of air attracted from inlet-port 2B is led to the duct member 60, is inhaled by the 2nd sirocco fan 53 and breathed out along the base of the sheathing case 2, it cools an electro-optic device 44. Cooling air is exhausted from exhaust-port 2E with this ventilating fan 54 next toward the axial flow ventilating fan 54 by the side of a tooth back, cooling the driver board which has been arranged in the upper part of the optical unit 4 and which is not illustrated.

[0040] In the 3rd cooling system C, as an alternate long and short dash line shows in drawing 6 , the 3rd sirocco fan 55 is formed in the location corresponding to inlet-port 2C of sheathing case 2 base in the underside of a light guide 47. The dust and dust which whose inlet-port 2C is making each hole into a minor diameter as much as possible, and are on the installation part of a projector 1 are made hard to absorb. The cooling air inhaled by the 3rd sirocco fan 55 from inlet-port 2C After being breathed out at the light equipment 413 side through the duct-like part formed between the base of the sheathing case 2, and the underside of a light guide 47, It is led to opening for inhalation of air (not shown) prepared corresponding to the location where the integrator illumination-light study system 41 of a light guide 47 has been arranged. UV filter 418 besides the unit which consists of the 1st lens array 414 which constitutes the integrator illumination-light study system 41, and which was mentioned above, and the polarization sensing element 415 and the 2nd lens array 416 is cooled toward the upper part from a lower part. Cooling air is exhausted from the openings 48A and 48B (drawing 3) for exhaust air of covering 48, and is eventually exhausted from exhaust-port 2E next with the axial flow ventilating fan 54 by the side of a tooth back.

[0041] [Structure of 4. optic] In the optic which consists of an electro-optic device 44 and a cross dichroic prism 45, as shown in drawing 6 and drawing 9 , an electro-optic device 44 is supported by the cross dichroic prism 45, and this cross dichroic prism 45 is attached in optical outgoing radiation side 49 (drawing 7) of a light guide 47 through the supporter material 70 which supports the cross dichroic prism 45 concerned. The supporter material 70 is equipped with the installation section 71 in which the cross dichroic prism 45 is laid, and four advice fixed parts 72 for guiding and fixing this installation section 71 to optical outgoing radiation side 49 of a light guide 47. From the installation section 71, the advice fixed part 72 projects to the side, and is prepared in it, and the cross dichroic prism 45 is attached in optical outgoing radiation side 49 of a light guide 47 by being fixed with the screw thread which this advice fixed part 72 and optical outgoing radiation side 49 of a light guide 47 do not illustrate.

[0042] As shown in drawing 9 and drawing 10 , the liquid crystal panels 441R, 441G, and 441B of three sheets which constitute an electro-optic device 44 are held by the maintenance frame 81 made of synthetic resin, and opposite arrangement is carried out with three side faces used as the optical plane of incidence of the cross dichroic prism 45. On

the other hand, the metal frame 82 is attached in three side faces used as the optical plane of incidence of the cross dichroic prism 45, and connection immobilization of the maintenance frame 81 and the frame 82 is carried out through four lock-pins 83 made of transparence resin.

[0043] The maintenance frame 81 is formed in the shape of a rectangle frame, and holds the periphery of liquid crystal panels 441R, 441G, and 441B. Moreover, as shown also in drawing 11 , insertion hole 81A which a lock-pin 83 is inserted and is fixed is prepared in the four corners of the maintenance frame 81, respectively.

[0044] As shown in drawing 10 and drawing 11 , a frame 82 is made into the shape of a rectangle frame by which cope box section 82A, drag flask section 82B, and two side frame section 82C were formed in one, and is formed by punching processing of a sheet metal etc. The film mounting section 821 for attaching the viewing-angle compensation film 419 is formed in each side frame section 82C. This film mounting section 821 is projected and formed in the electro-optic device 44 side by carrying out spinning of the middle of side frame section 82C, and has clamp-face 821A to which the field of the viewing-angle compensation film 419 is fixed. Clamp-face 821A is mostly made into the optical plane of incidence of the cross dichroic prism 45 with parallel, and the viewing-angle compensation film 419 is attached ranging over the film mounting section 821 of two side frame section 82C.

[0045] As for such a frame 82, a part of the field of a side and an opposite hand in which the viewing-angle compensation film 419 is attached, i.e., cope box section 82A, drag flask section 82B, and side frame section 82C (parts other than film mounting section 821) are fixed to the periphery of the optical plane of incidence of the cross dichroic prism 45 with adhesives etc. In the condition of having been fixed, opposite arrangement of the viewing-angle compensation film 419 is carried out through an opening to the optical plane of incidence of the cross dichroic prism 45. In here, the periphery configuration of a frame 82 is formed more greatly than the 45th page of a cross dichroic prism. Concretely, as shown in drawing 10 , the width-of-face dimension a of cope box section 82A and the width-of-face dimension b of drag flask section 82B are formed more greatly than the width-of-face dimension c of side frame section 82C. Cope box section 82A is in the condition to which the most projected in the upper part from the cross dichroic prism 45, and drag flask section 82B is in the condition in which the most projected caudad from the cross dichroic prism 45, and is attached in the optical plane of incidence of the cross dichroic prism 45. Thus, cope box section 82A and drag flask section 82B are installed in the condition of having projected from the optical plane of incidence of the cross dichroic prism 45, and since adhesion side 833A which a lock-pin 83 mentions later is pasted up on this projection part, regardless of the magnitude of the cross dichroic prism 45, large adhesion / fixed area with a lock-pin 83 can be taken by enlarging the projection part of a frame 82. Moreover, when the viewing-angle compensation film 419 is attached, the permeability between the viewing-angle compensation film 419 and the cross dichroic prism 45 is secured by the opening formed between the viewing-angle compensation film 419 and the cross dichroic prism 45.

[0046] A lock-pin 83 is arranged at the prismatic form outcrop [which it is arranged at the end side of the insertion section 831 of the shape of a cylindrical shape inserted in insertion hole 81A of the maintenance frame 81, and this insertion section 831, and is exposed outside at the time of insertion] 832, and other end side of the insertion section 831, and is constituted by the frame 82 including the jointing 833 by which adhesion immobilization is carried out. Among these, jointing 833 equips a frame 82 with adhesion side 833A by which adhesion immobilization is carried out, and the cross section of this jointing 833, i.e., the area of adhesion side 833A, may be formed more greatly than the cross section of the insertion section 831.

[0047] The optic which consists of such an electro-optic device 44 and a cross dichroic prism 45 is assembled as follows. First, liquid crystal panels 441R, 441G, and 441B are attached in the maintenance frame 81, and a frame 82 is attached in installation and the cross dichroic prism 45. And the viewing-angle compensation film 419 is carried out with adhesives etc., and connection immobilization of installation, the maintenance frame 81, and the frame 82 is carried out with a lock-pin 83 at the film mounting section 821 of a frame 82. Under the present circumstances, a lock-pin 83 is in the condition which applied the adhesives of an ultraviolet curing mold to the insertion section 831 and adhesion side 833A, and while being inserted in insertion hole 81A of the maintenance frame 81, adhesion side 833A is contacted by the four corners (projection part from the 45th page of the cross dichroic prism of cope box section 82A mentioned above and drag flask section 82B) of a frame 82. After adjusting the location of G and 441B, ultraviolet rays are irradiated from the liquid crystal panel 441R [to the cross dichroic prism 45], and 441 outcrop 832 side of a lock-pin 83, and adhesives are stiffened. Thereby, liquid crystal panels 441R, 441G, and 441B are fixed to the optical plane-of-incidence side of the cross dichroic prism 45.

[0048] According to these above operation gestalten, there is the following effectiveness.

(1) Since a frame 82 is attached in the cross dichroic prism 45 and the maintenance frame 81 which holds liquid crystal panels 441R, 441G, and 441B to this frame 82 is attached through the lock-pin 83, in the optic which consists of an electro-optic device 44 and a cross dichroic prism 45, it is not necessary to fix a lock-pin 83 to the direct cross dichroic

the other hand, the metal frame 82 is attached in three side faces used as the optical plane of incidence of the cross dichroic prism 45, and connection immobilization of the maintenance frame 81 and the frame 82 is carried out through four lock-pins 83 made of transparence resin.

[0043] The maintenance frame 81 is formed in the shape of a rectangle frame, and holds the periphery of liquid crystal panels 441R, 441G, and 441B. Moreover, as shown also in drawing 11 , insertion hole 81A which a lock-pin 83 is inserted and is fixed is prepared in the four corners of the maintenance frame 81, respectively.

[0044] As shown in drawing 10 and drawing 11 , a frame 82 is made into the shape of a rectangle frame by which cope box section 82A, drag flask section 82B, and two side frame section 82C were formed in one, and is formed by punching processing of a sheet metal etc. The film mounting section 821 for attaching the viewing-angle compensation film 419 is formed in each side frame section 82C. This film mounting section 821 is projected and formed in the electro-optic device 44 side by carrying out spinning of the middle of side frame section 82C, and has clamp-face 821A to which the field of the viewing-angle compensation film 419 is fixed. Clamp-face 821A is mostly made into the optical plane of incidence of the cross dichroic prism 45 with parallel, and the viewing-angle compensation film 419 is attached ranging over the film mounting section 821 of two side frame section 82C.

[0045] As for such a frame 82, a part of the field of a side and an opposite hand in which the viewing-angle compensation film 419 is attached, i.e., cope box section 82A, drag flask section 82B, and side frame section 82C (parts other than film mounting section 821) are fixed to the periphery of the optical plane of incidence of the cross dichroic prism 45 with adhesives etc. In the condition of having been fixed, opposite arrangement of the viewing-angle compensation film 419 is carried out through an opening to the optical plane of incidence of the cross dichroic prism 45. In here, the periphery configuration of a frame 82 is formed more greatly than the 45th page of a cross dichroic prism. Concretely, as shown in drawing 10 , the width-of-face dimension a of cope box section 82A and the width-of-face dimension b of drag flask section 82B are formed more greatly than the width-of-face dimension c of side frame section 82C. Cope box section 82A is in the condition to which the most projected in the upper part from the cross dichroic prism 45, and drag flask section 82B is in the condition in which the most projected caudad from the cross dichroic prism 45, and is attached in the optical plane of incidence of the cross dichroic prism 45. Thus, cope box section 82A and drag flask section 82B are installed in the condition of having projected from the optical plane of incidence of the cross dichroic prism 45, and since adhesion side 833A which a lock-pin 83 mentions later is pasted up on this projection part, regardless of the magnitude of the cross dichroic prism 45, large adhesion / fixed area with a lock-pin 83 can be taken by enlarging the projection part of a frame 82. Moreover, when the viewing-angle compensation film 419 is attached, the permeability between the viewing-angle compensation film 419 and the cross dichroic prism 45 is secured by the opening formed between the viewing-angle compensation film 419 and the cross dichroic prism 45.

[0046] A lock-pin 83 is arranged at the prismatic form outcrop [which it is arranged at the end side of the insertion section 831 of the shape of a cylindrical shape inserted in insertion hole 81A of the maintenance frame 81, and this insertion section 831, and is exposed outside at the time of insertion] 832, and other end side of the insertion section 831, and is constituted by the frame 82 including the jointing 833 by which adhesion immobilization is carried out. Among these, jointing 833 equips a frame 82 with adhesion side 833A by which adhesion immobilization is carried out, and the cross section of this jointing 833, i.e., the area of adhesion side 833A, may be formed more greatly than the cross section of the insertion section 831.

[0047] The optic which consists of such an electro-optic device 44 and a cross dichroic prism 45 is assembled as follows. First, liquid crystal panels 441R, 441G, and 441B are attached in the maintenance frame 81, and a frame 82 is attached in installation and the cross dichroic prism 45. And the viewing-angle compensation film 419 is carried out with adhesives etc., and connection immobilization of installation, the maintenance frame 81, and the frame 82 is carried out with a lock-pin 83 at the film mounting section 821 of a frame 82. Under the present circumstances, a lock-pin 83 is in the condition which applied the adhesives of an ultraviolet curing mold to the insertion section 831 and adhesion side 833A, and while being inserted in insertion hole 81A of the maintenance frame 81, adhesion side 833A is contacted by the four corners (projection part from the 45th page of the cross dichroic prism of cope box section 82A mentioned above and drag flask section 82B) of a frame 82. After adjusting the location of G and 441B, ultraviolet rays are irradiated from the liquid crystal panel 441R [to the cross dichroic prism 45], and 441 outcrop 832 side of a lock-pin 83, and adhesives are stiffened. Thereby, liquid crystal panels 441R, 441G, and 441B are fixed to the optical plane-of-incidence side of the cross dichroic prism 45.

[0048] According to these above operation gestalten, there is the following effectiveness.

(1) Since a frame 82 is attached in the cross dichroic prism 45 and the maintenance frame 81 which holds liquid crystal panels 441R, 441G, and 441B to this frame 82 is attached through the lock-pin 83, in the optic which consists of an electro-optic device 44 and a cross dichroic prism 45, it is not necessary to fix a lock-pin 83 to the direct cross dichroic

prism 45, and to secure the area for fixing a lock-pin 83 to cross dichroic prism 45 self. For this reason, the cross dichroic prism 45 of necessary minimum magnitude can be used optically, and cross dichroic prism 45 the very thing can be made small. Moreover, while forming more broadly than side frame section 82C cope box section 82A of a frame 82, and drag flask section 82B Since cope box section 82A and drag flask section 82B were installed in the condition of having projected from the optical plane of incidence of the cross dichroic prism 45 and adhesion side 833A which a lock-pin 83 mentions later is pasted up on this projection part It comes to be able to enlarge adhesion / fixed area with a lock-pin 83 by enlarging the projection part of a frame 82 regardless of the magnitude of the cross dichroic prism 45. For this reason, the fixed reinforcement of a lock-pin 83 and a frame 82 is fully obtained, and can certainly fix liquid crystal panels 441R, 441G, and 441B to the cross dichroic prism 45 side.

[0049] In a frame 82 (2) The width-of-face dimension a of cope box section 82A, and the width-of-face dimension b of drag flask section 82B Since it considers as the condition that it is formed more greatly than the width-of-face dimension c of side frame section 82C, and the great portion of cope box section 82A and drag flask section 82B projected from the 45th page of a cross dichroic prism, respectively Without a frame 82 covering most fields of the cross dichroic prism 45, even if the cross dichroic prism 45 is small, large adhesion / fixed area with a lock-pin 83 can be taken. Thereby, a lock-pin 83 44, i.e., an electro-optic device, is certainly fixable to the cross dichroic prism 45 side.

[0050] (3) Since the maintenance frame 81 made from plastics and the cross dichroic prism 45 made from optical glass which are generally used to optical instruments, such as a projector, are used, it can constitute economically. Moreover, since the frame 82 is formed by punching processing of a sheet metal, it can be easily formed in the configuration of a request of a frame 82. Furthermore, since coefficient of thermal expansion has connected the maintenance frame 81 made of synthetic resin, and the cross dichroic prism 45 made from optical glass with this operation gestalt through the metal frame 82 which it is between synthetic resin and glass, even if heat arises from the light source etc. at the time of the activity of a projector 1, it is cushion ON ******** with a frame 82 to the difference of the thermal expansion of the cross dichroic prism 45 and the maintenance frame 81. Thereby, a gap of the relative position by the differential thermal expansion of the maintenance frame 81 and the cross dichroic prism 45 can be controlled.

[0051] (4) Since the film mounting section 821 is formed in the frame 82, while being able to make easy installation to the frame 82 of the viewing-angle compensation film 419, the viewing-angle compensation film 419 can be easily arranged between liquid crystal panels 441R, 441G, and 441B and the cross dichroic prism 45.

[0052] (5) Since the opening is formed between the clamp face of the film mounting section 821 of a frame 82, and the field of the cross dichroic prism 45, the viewing-angle compensation film 419 is opened from the cross dichroic prism 45, predetermined spacing can be installed, and the permeability between the viewing-angle compensation film 419 and the cross dichroic prism 45 can be made good.

[0053] (6) By forming greatly adhesion side 833A of the lock-pin 83 by which adhesion immobilization is carried out at the cross dichroic prism 45 side, bond strength of a lock-pin 83 and a frame 82 can be enlarged more.

[0054] (7) The optic which consists of an electro-optic device and a cross dichroic prism is assembled with a maintenance frame, a frame, and a lock-pin which were mentioned above, and the projector 1 which can miniaturize the cross dichroic prism 45 while it can fully obtain the bond strength of the cross dichroic prism 45 and a lock-pin 83, since the projector 1 of this operation gestalt is constituted using the optic concerned is obtained, as a result a projector 1 can be miniaturized.

[0055] (8) Since the main power supply 31 energized to a liquid crystal panel 441 is formed in the projector 1, the electrical and electric equipment can be easily supplied to each liquid crystal panel 441.

[0056] In addition, this invention is not limited to said operation gestalt, and the deformation in the range which can attain the object of this invention, and amelioration are included in this invention. For example, although the area of adhesion side 833A of a lock-pin 83 is formed in the almost same magnitude as the cross section of insertion section 831 grade with said operation gestalt, the lock-pin concerning this invention may be lock-pin 83A as not limited to this and shown in drawing 12 . As for this lock-pin 83A, the magnitude of that adhesion side 833A has become larger than the cross section of the insertion section 831 or an outcrop 832. If such lock-pin 83A is used, adhesion area of lock-pin 83A and a frame 82 can be enlarged, and the bond strength of lock-pin 83A and a frame 82 can fully be secured.

[0057] In said operation gestalt, although the opening more than predetermined spacing is formed between clamp-face 821A of the film mounting section 821, and the field of the cross dichroic prism 45, such an opening should just be suitably formed between prism and an optical film according to the need for aeration rather than is necessarily required.

[0058] With said operation gestalt, although the viewing-angle compensation film 419 was formed as an optical film, the optical film concerning this invention is not limited to this, and various optical films, such as a phase contrast plate and a polarizing plate, may be prepared, corresponding to the application of the optic which consists of an electro-optic device and prism.

prism 45, and to secure the area for fixing a lock-pin 83 to cross dichroic prism 45 self. For this reason, the cross dichroic prism 45 of necessary minimum magnitude can be used optically, and cross dichroic prism 45 the very thing can be made small. Moreover, while forming more broadly than side frame section 82C cope box section 82A of a frame 82, and drag flask section 82B Since cope box section 82A and drag flask section 82B were installed in the condition of having projected from the optical plane of incidence of the cross dichroic prism 45 and adhesion side 833A which a lock-pin 83 mentions later is pasted up on this projection part It comes to be able to enlarge adhesion / fixed area with a lock-pin 83 by enlarging the projection part of a frame 82 regardless of the magnitude of the cross dichroic prism 45. For this reason, the fixed reinforcement of a lock-pin 83 and a frame 82 is fully obtained, and can certainly fix liquid crystal panels 441R, 441G, and 441B to the cross dichroic prism 45 side.

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[0051] (4) Since the film mounting section 821 is formed in the frame 82, while being able to make easy installation to the frame 82 of the viewing-angle compensation film 419, the viewing-angle compensation film 419 can be easily arranged between liquid crystal panels 441R, 441G, and 441B and the cross dichroic prism 45.

[0052] (5) Since the opening is formed between the clamp face of the film mounting section 821 of a frame 82, and the field of the cross dichroic prism 45, the viewing-angle compensation film 419 is opened from the cross dichroic prism 45, predetermined spacing can be installed, and the permeability between the viewing-angle compensation film 419 and the cross dichroic prism 45 can be made good.

[0053] (6) By forming greatly adhesion side 833A of the lock-pin 83 by which adhesion immobilization is carried out at the cross dichroic prism 45 side, bond strength of a lock-pin 83 and a frame 82 can be enlarged more.

[0054] (7) The optic which consists of an electro-optic device and a cross dichroic prism is assembled with a maintenance frame, a frame, and a lock-pin which were mentioned above, and the projector 1 which can miniaturize the cross dichroic prism 45 while it can fully obtain the bond strength of the cross dichroic prism 45 and a lock-pin 83, since the projector 1 of this operation gestalt is constituted using the optic concerned is obtained, as a result a projector 1 can be miniaturized.

[0055] (8) Since the main power supply 31 energized to a liquid crystal panel 441 is formed in the projector 1, the electrical and electric equipment can be easily supplied to each liquid crystal panel 441.

[0056] In addition, this invention is not limited to said operation gestalt, and the deformation in the range which can attain the object of this invention, and amelioration are included in this invention. For example, although the area of adhesion side 833A of a lock-pin 83 is formed in the almost same magnitude as the cross section of insertion section 831 grade with said operation gestalt, the lock-pin concerning this invention may be lock-pin 83A as not limited to this and shown in drawing 12 . As for this lock-pin 83A, the magnitude of that adhesion side 833A has become larger than the cross section of the insertion section 831 or an outcrop 832. If such lock-pin 83A is used, adhesion area of lock-pin 83A and a frame 82 can be enlarged, and the bond strength of lock-pin 83A and a frame 82 can fully be secured.

[0057] In said operation gestalt, although the opening more than predetermined spacing is formed between clamp-face 821A of the film mounting section 821, and the field of the cross dichroic prism 45, such an opening should just be suitably formed between prism and an optical film according to the need for aeration rather than is necessarily required.

[0058] With said operation gestalt, although the viewing-angle compensation film 419 was formed as an optical film, the optical film concerning this invention is not limited to this, and various optical films, such as a phase contrast plate and a polarizing plate, may be prepared, corresponding to the application of the optic which consists of an electro-optic device and prism.

[0059] With said operation gestalt, although the film mounting section 821 was formed in the frame 82, it does not need to be prepared and, also in such a case, is contained in this invention. For example, when an optical film like the viewing-angle compensation film 419 mentioned above is not arranged between a liquid crystal panel 441 and the cross dichroic prism 45, it is not necessary to form the film mounting section 821 in a frame 82.

[0060] In said operation gestalt, although the maintenance frame 81 is formed with plastics, the cross dichroic prism 45 is formed with optical glass and the frame 82 is formed with the metal, these maintenance frame, prism, and a frame may be formed from other ingredients, are considered from various fields, such as processing ease and profitability, and may be chosen suitably.

[0061] Although only the example of the projector which used three light modulation equipments was given with said operation gestalt, this invention is applicable also to the projector which used only one light modulation equipment, the projector using two light modulation equipments, or the projector using four or more light modulation equipments. Moreover, with said operation gestalt, although the liquid crystal panel was used as light modulation equipment, light modulation equipments other than liquid crystal, such as a device using a micro mirror, may be used. Furthermore, although the light modulation equipment of the transparency mold with which optical plane of incidence differs from an optical outgoing radiation side was used with said operation gestalt, the light modulation equipment of the reflective mold with which optical plane of incidence and an optical outgoing radiation side become the same may be used. With said operation gestalt, although only the example of the front type projector which performs projection was given from the direction which observes a screen, this invention can be applied also to the rear type projector which performs projection from an opposite hand further again with the direction which observes a screen.

[0062]

[Effect of the Invention] Since according to this invention a frame is attached in prism and the maintenance frame which holds light modulation equipment to this frame is attached through the lock-pin, it is not necessary to secure the area for fixing a lock-pin to the field of prism, and magnitude of prism can be optically made into necessary minimum magnitude. Moreover, since it is fixed to a frame, if magnitude, width of face, etc. of a frame are set up greatly, a lock-pin can take a large fixed area of a lock-pin and a frame, and is effective in light modulation equipment being certainly fixable to prism.

[Translation done.]

[0059] With said operation gestalt, although the film mounting section 821 was formed in the frame 82, it does not need to be prepared and, also in such a case, is contained in this invention. For example, when an optical film like the viewing-angle compensation film 419 mentioned above is not arranged between a liquid crystal panel 441 and the cross dichroic prism 45, it is not necessary to form the film mounting section 821 in a frame 82.

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[0062]

[Effect of the Invention] Since according to this invention a frame is attached in prism and the maintenance frame which holds light modulation equipment to this frame is attached through the lock-pin, it is not necessary to secure the area for fixing a lock-pin to the field of prism, and magnitude of prism can be optically made into necessary minimum magnitude. Moreover, since it is fixed to a frame, if magnitude, width of face, etc. of a frame are set up greatly, a lock-pin can take a large fixed area of a lock-pin and a frame, and is effective in light modulation equipment being certainly fixable to prism.

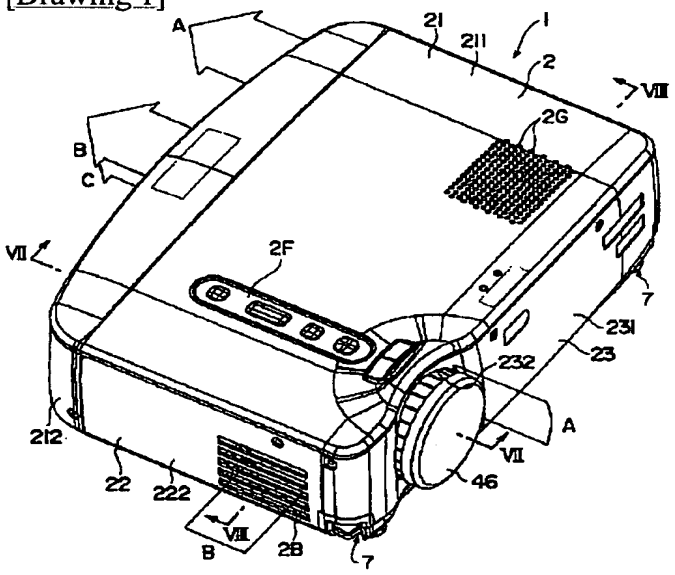
[Translation done.]

* NOTICES *

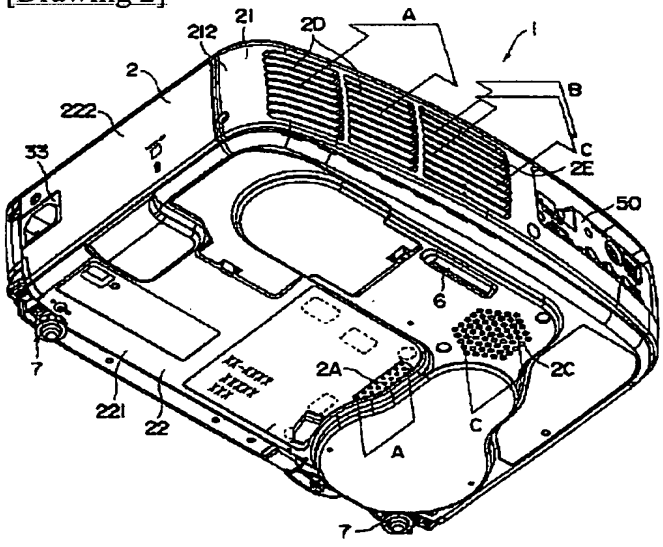
1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

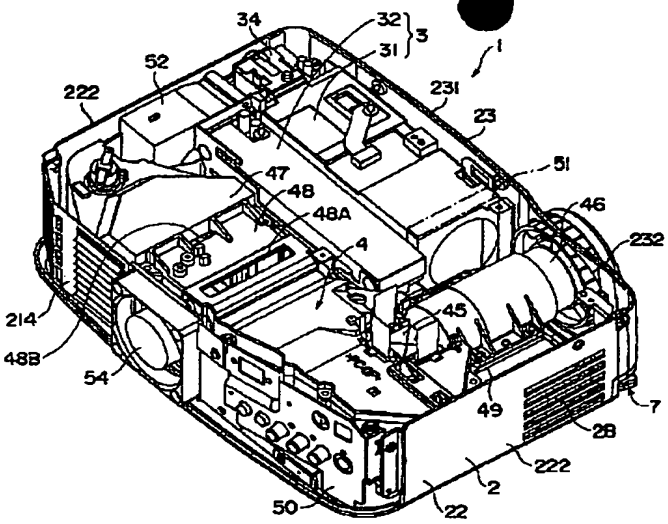
[Drawing 1]



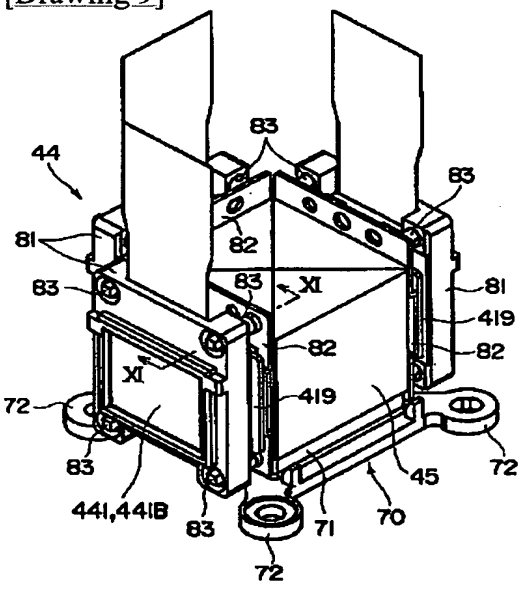
[Drawing 2]



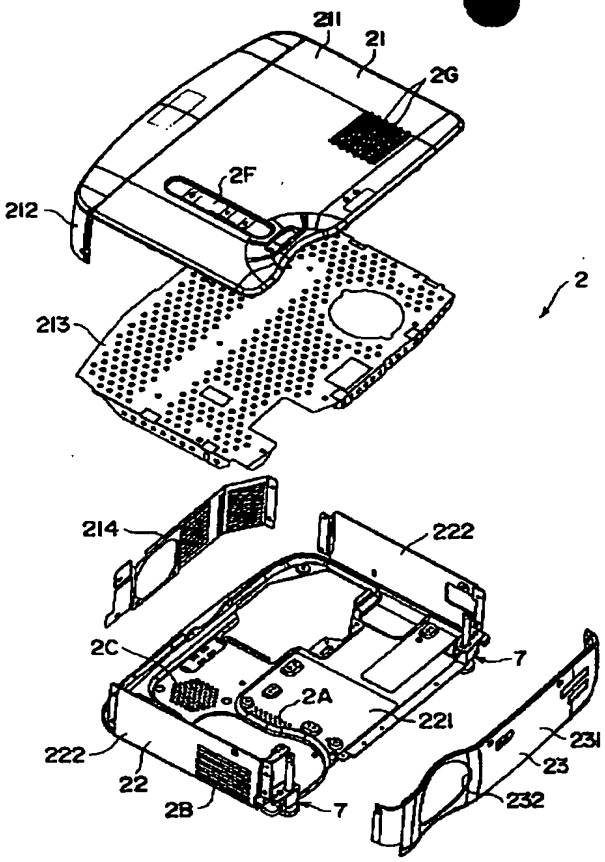
[Drawing 3]



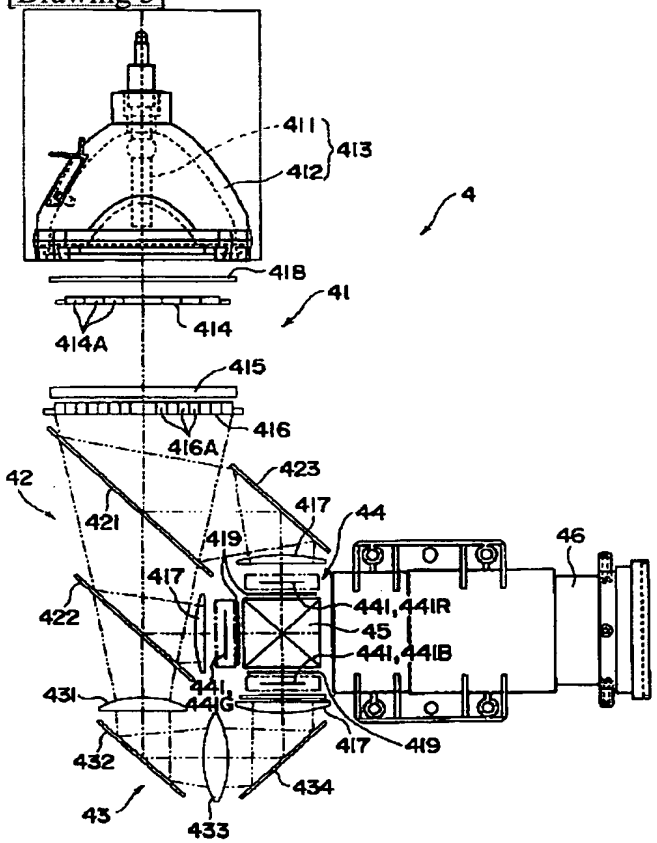
[Drawing 9]



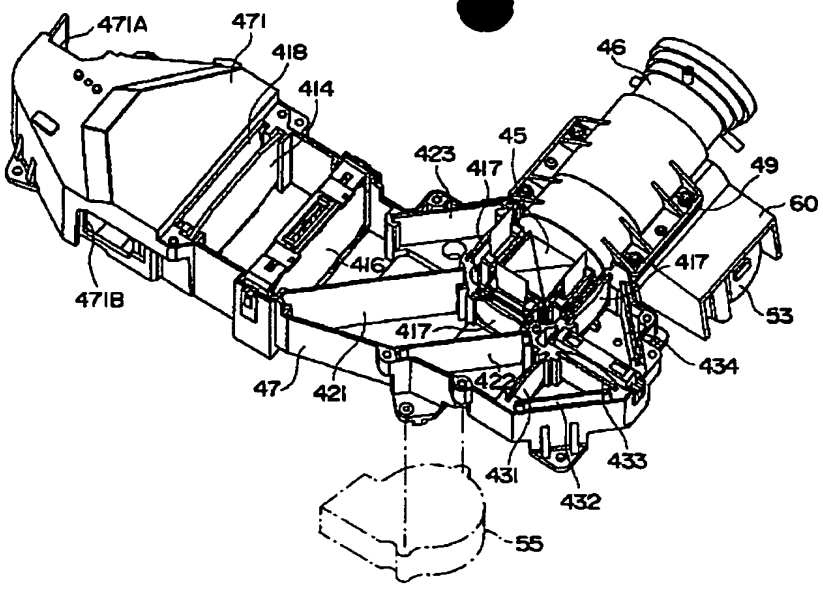
[Drawing 4]



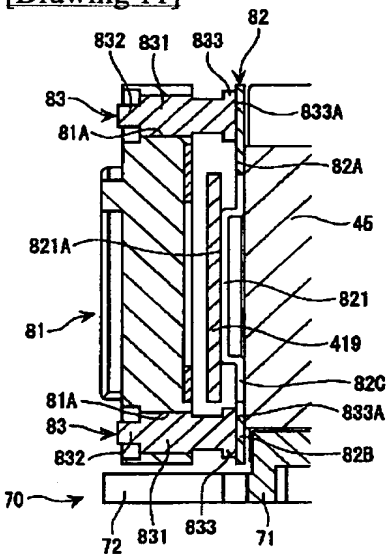
[Drawing 5]



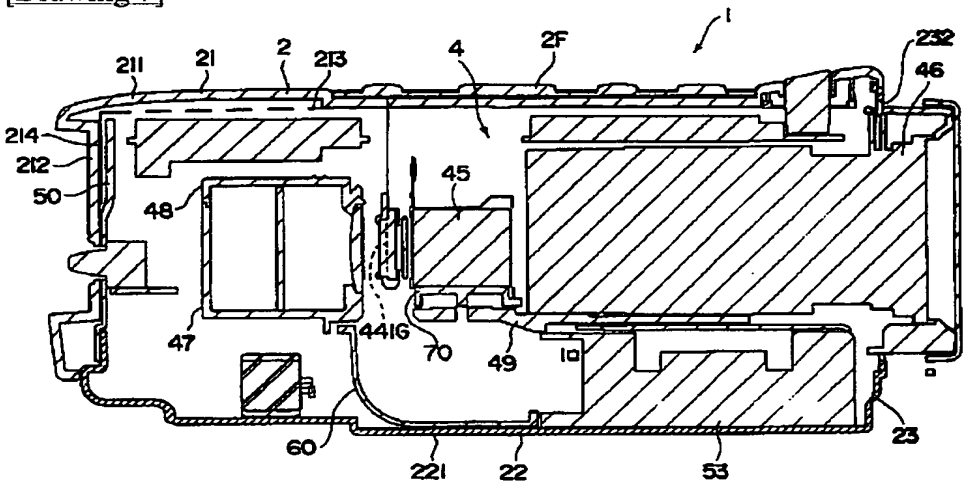
[Drawing 6]



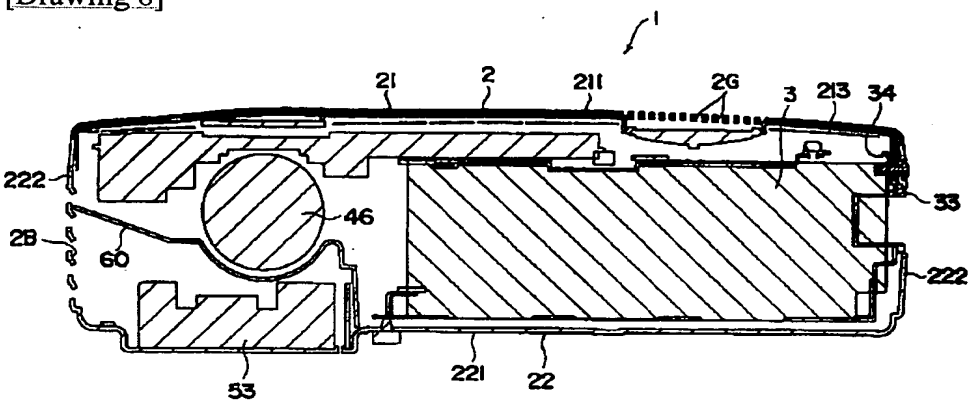
[Drawing 11]



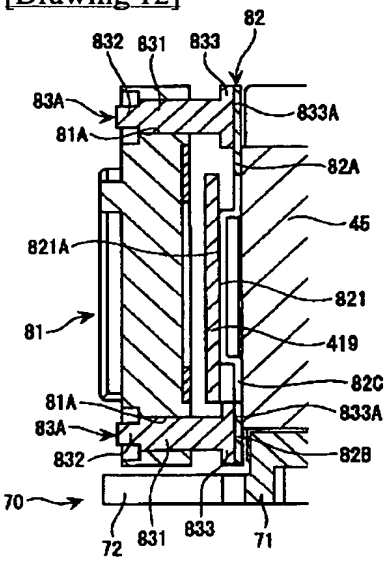
[Drawing 7]



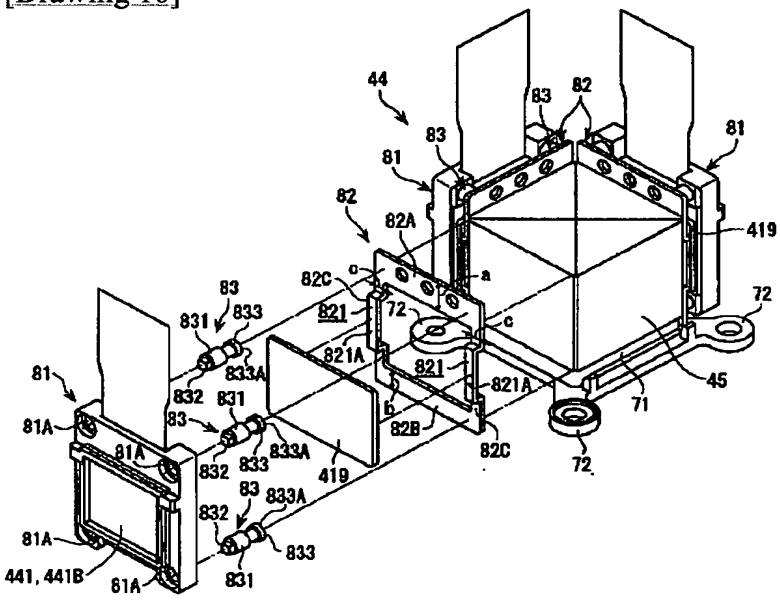
[Drawing 8]



[Drawing 12]



[Drawing 10]



[Translation done.]

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(51)Int.Cl.⁷	識別記号	ＦＩ		テーマコード(参考)
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Ｇ０２Ｂ　5/04		Ｇ０２Ｂ　5/04	Ａ	２Ｈ０４３
7/18		Ｇ０２Ｆ　1/13	５０５	２Ｈ０８８
Ｇ０２Ｆ　1/13	５０５	Ｇ０３Ｂ　33/12		５Ｃ０５８
Ｇ０３Ｂ　33/12		Ｇ０９Ｆ　9/00	３６０Ｋ	５Ｃ０６０

審査請求　未請求　請求項の数８　ＯＬ　（全 12 頁）　最終頁に続く

(21)出願番号　特願2000－208444(P2000－208444)

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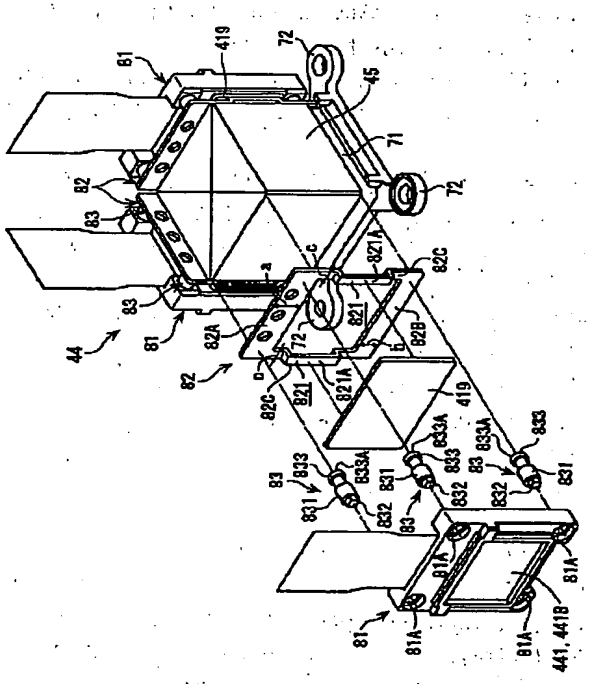
(74)代理人　100095728
弁理士　上柳　雅誉　（外１名）

最終頁に続く

(54)【発明の名称】光学部品およびこれを備えたプロジェクタ

(57)【要約】
【課題】　光変調装置側とプリズム側とを確実に固定できるとともに、プリズムを光学的に必要最小限の大きさとすることができる光学部品およびプロジェクタを提供すること。
【解決手段】　クロスダイクロイックプリズム４５に枠体８２を取り付け、枠体８２に固定ピン８３を介して液晶パネル４４１を保持する保持枠８１を取り付けた。固定ピン８３を直接クロスダイクロイックプリズム４５に固定しなくてすむので、光学的に必要最小限の大きさのクロスダイクロイックプリズム４５を使用できる。また、固定ピン８３が枠体８２に固定され、枠体８２の固定ピンとの固定面積を大きくとっているので、固定ピン８３と枠体８２との固定強度が十分に得られ、液晶パネル４４１をクロスダイクロイックプリズム４５側に確実に固定できる。



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【特許請求の範囲】

【請求項１】　光変調装置と、この光変調装置を保持する保持枠と、プリズムと、前記保持枠を前記プリズムに固定するための固定ピンとを備えた光学部品であって、前記プリズムの面に取り付けられる枠体を備え、かつ、前記固定ピンの一端側が前記保持枠に固定され、他端側が前記枠体に固定されていることを特徴とする光学部品。

【請求項２】　請求項１に記載の光学部品において、前記枠体の外周形状は、当該枠体が取り付けられる前記プリズムの面よりも大きく形成されていることを特徴とする光学部品。

【請求項３】　請求項１または請求項２に記載の光学部品において、

前記保持枠は、合成樹脂で形成され、前記プリズムは、光学ガラスで形成され、前記枠体は、金属で形成されていることを特徴とする光学部品。

【請求項４】　請求項１ないし請求項３のいずれかに記載の光学部品において、

前記枠体には、光学フィルムを取り付けるためのフィルム取付部が設けられていることを特徴とする光学部品。

【請求項５】　請求項４に記載の光学部品において、

前記光学フィルムが取り付けられる前記フィルム取付部の取付面と、前記枠体が取り付けられる前記プリズムの面との間には、空隙が形成されていることを特徴とする光学部品。

【請求項６】　光変調装置と、この光変調装置を保持する保持枠と、プリズムと、前記保持枠を前記プリズムに固定するための固定ピンを備えた光学部品であって、

前記固定ピンは、一端側が前記保持枠に固定され、他端側が前記プリズム側に接着固定され、

前記固定ピンの他端側の断面積は、前記一端側の断面積よりも大きく形成されていることを特徴とする光学部品。

【請求項７】　複数の色光を画像情報に応じて変調する光変調装置と、この光変調装置で変調された光を合成するプリズムとを備え、当該プリズムで合成された光を拡大投写して投写画像を形成するプロジェクタであって、請求項１ないし請求項６のいずれかに記載の光学部品を備えていることを特徴とするプロジェクタ。

【請求項８】　請求項７に記載のプロジェクタにおいて、前記光変調装置に通電する電源を備えていることを特徴とするプロジェクタ。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】本発明は、光学部品およびこれを備えたプロジェクタに係り、詳しくは、電気光学装置と、この電気光学装置を保持する保持枠と、プリズムと、保持枠およびプリズムを固定するための固定ピンとを備えた光学部品およびプロジェクタに関する。

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【０００２】

【従来の技術】近年、プロジェクタを使用する環境が拡がりつつあり、社内会議や出張先でのプレゼンテーションなどで用いられる他、ＣＡＤ／ＣＡＭ／ＣＡＥのデータを取り込んで拡大投写することで、研究開発部門等での技術検討会に用いられたり、各種セミナーや研修会、さらには視聴覚教育を行う学校の授業でも用いられている。また、ＣＴスキャンやＭＲＩなどの医療画像やデータを投写し、治療法の検討、医療指導などに役立てたり、展示会や大勢が集まるイベントなどを効果的に演出するのにも用いられる。

【０００３】このように、あるゆる環境でプロジェクタが用いられる現在では、プロジェクタに求められる仕様・機能も様々であり、携帯性を追求した軽量コンパクトモデル、画像品質を追求した高輝度モデルおよび高解像度モデル、各デジタル機器やモバイルツールとの接続を可能にした高機能モデルなどがある。そして、使用される環境のさらなる拡大が予想されることから、新たな使用環境を想定したより高付加価値のプロジェクタの開発が盛んに行われている。

【０００４】ところで、上述したようなプロジェクタとしては、従来より、複数の色光を画像情報に応じて変調する電気光学装置と、当該電気光学装置で変調された光を合成するクロスダイクロイックプリズムと、このクロスダイクロイックプリズムで合成された光を拡大投写する投写レンズとを備えたプロジェクタが知られている。

【０００５】このようなプロジェクタでは、小型化に対応するとともに、構造の簡素化を図るために、電気光学装置を構成する３つの光変調装置（たとえば、液晶パネル）を固定部材を介してクロスダイクロイックプリズムの側面に固定する構造が採用されている。このような構造としては、特願平１１－２５３４５号（本出願人が出願したもの）で提案されるものがあり、これは、光変調装置を保持する保持枠の四隅に孔をそれぞれ設け、この孔に固定ピンを挿通して固定し、ピンの先端をクロスダイクロイックプリズムの側面に直に接着固定することで、光変調装置をクロスダイクロイックプリズムに固定している。

【０００６】

【発明が解決しようとする課題】しかしながら、上述したような構造では、ピンの先端を直接クロスダイクロイックプリズムの側面に直に接着固定しているので、クロスダイクロイックプリズムの側面には固定ピンとの接着面積が必要となり、この接着面積の分だけクロスダイクロイックプリズムを大きく作らなければならないという問題がある。このため、構造自体は簡素化できても、クロスダイクロイックプリズム自体を小さくすることはできない。つまり、クロスダイクロイックプリズムを光学的に必要最小限の大きさとすることができない。少しでもクロスダイクロイックプリズムを小さくするために、

クロスダイクロイックプリズムと固定ピンとの接着面積を最小限の大きさにすることが考えられるが、接着面積を最小限にすると、クロスダイクロイックプリズムと固定ピンとの接着強度に不安が生じてしまい、ひいては、クロスダイクロイックプリズムと光変調装置との固定強度に不安が生じてしまう。

【０００７】本発明の目的は、光変調装置側とプリズム側とを確実に固定できるとともに、プリズムを光学的に必要最小限の大きさとすることができる光学部品およびプロジェクタを提供することにある。

【０００８】

【課題を解決するための手段】本発明の光学部品は、上記目的を達成するために、以下の構成を備える。請求項１に記載の発明は、光変調装置と、この光変調装置を保持する保持枠と、プリズムと、前記保持枠を前記プリズムに固定するための固定ピンとを備えた光学部品であって、前記プリズムの面に取り付けられる枠体を備え、かつ、前記固定ピンの一端側が前記保持枠に固定され、他端側が前記枠体に固定されていることを特徴とするものである。

【０００９】この発明によれば、プリズムには枠体が取り付けられ、この枠体に、光変調装置を保持する保持枠が固定ピンを介して取り付けられているので、固定ピンを直接プリズムに固定しなくてすみ、固定ピンを固定するための面積をプリズム自体に確保する必要がない。これにより、プリズムは、光学的に必要最小限の大きさを有していればよく、プリズム自体が小さくなる。また、固定ピンは枠体に固定されるので、枠体の大きさや幅等を大きくとれば、固定ピンを固定するための面積をプリズムの大きさに関係なく大きくとることができるようになる。このため、固定ピンと枠体との固定強度が十分に得られ、光変調装置がプリズム側に確実に固定される。

【００１０】請求項２に記載の発明は、請求項１に記載の光学部品において、前記枠体の外周形状は、当該枠体が取り付けられる前記プリズムの面よりも大きく形成されていることを特徴とするものである。この発明によれば、枠体の外周形状がプリズムの面よりも大きく形成されているので、プリズムの面が枠体にほとんど覆われずに、かつ、プリズムの大きさに関係なく固定ピンを固定するための面積を大きくとれる。これにより、固定ピン、つまり光変調装置がプリズム側に確実に固定される。

【００１１】請求項３に記載の発明は、請求項１または請求項２に記載の光学部品において、前記保持枠は、合成樹脂で形成され、前記プリズムは、光学ガラスで形成され、前記枠体は、金属で形成されていることを特徴とするものである。この発明によれば、たとえばプロジェクタ等の光学機器に一般的に用いられる合成樹脂製の保持枠および光学ガラス製のプリズムを使用しているので、経済的に構成できるようになる。また、枠体は金属

製なので、板金等を用いれば、枠体を所望の形状に形成しやすい。さらに、光学部品を、たとえばプロジェクタに用いた場合、光源等から発生する熱で保持枠やプリズム等が膨張することがある。通常、保持枠は、プラスチック製であることが多く、光学ガラス製のプリズムよりも熱膨張率が高い。このため、従来の光学部品では、プロジェクタの使用時に、保持枠がプリズムよりも大きく熱膨張してしまい、保持枠とプリズムとの相対位置、すなわち光変調装置とプリズムとの相対位置にずれが生じてしまうおそれがある。本発明では、熱膨張率が合成樹脂とガラスとの間である金属製の枠体を介して、合成樹脂製の保持枠と、光学ガラス製のプリズムとを連結しているから、たとえばプロジェクタ使用時に熱が生じても、枠体でプリズムと保持枠との熱膨張の差にワンクッション入れられる。これにより、保持枠とプリズムとの熱膨張差による相対位置のずれが抑制される。

【００１２】請求項４に記載の発明は、請求項１ないし請求項３のいずれかに記載の光学部品において、前記枠体には、光学フィルムを取り付けるためのフィルム取付部が設けられていることを特徴とするものである。この発明によれば、枠体にはフィルム取付部が設けられているので、光学フィルムの枠体への取り付けが容易になる。ここで、光学フィルムとしては、たとえば、位相差板、偏光板、および広視野角フィルム等が挙げられる。

【００１３】請求項５に記載の発明は、請求項４に記載の光学部品において、前記光学フィルムが取り付けられる前記フィルム取付部の取付面と、前記枠体が取り付けられる前記プリズムの面との間には、空隙が形成されていることを特徴とするものである。この発明によれば、枠体のフィルム取付部の取付面と、プリズムの面との間には、空隙が形成されているから、光学フィルムをプリズムから所定間隔をあけて設置でき、光学フィルムとプリズムとの間の通気性を良好に保てる。

【００１４】請求項６に記載の発明は、光変調装置と、この光変調装置を保持する保持枠と、プリズムと、前記保持枠を前記プリズムに固定するための固定ピンを備えた光学部品であって、前記固定ピンは、一端側が前記保持枠に固定され、他端側が前記プリズム側に接着固定され、前記固定ピンの他端側の断面積は、前記一端側の断面積よりも大きく形成されていることを特徴とするものである。

【００１５】この発明によれば、プリズム側に接着固定される固定ピンの他端側の断面積が大きく形成されている。すなわち、接着面となる固定ピンの他端側の端面が大きく形成されているので、固定ピンとプリズム側との接着強度がより十分に確保される。ここで、固定ピンの他端側は、プリズムに直接接着固定されてもよく、上述したような請求項１ないし請求項５のいずれかに記載の発明に係る枠体に接着固定されてもよく、要するに、プリズム側と接着固定されればよい。

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【００１６】一方、本発明のプロジェクタは、上記目的を達成するために、以下の構成を備える。請求項７に記載の発明は、複数の色光を画像情報に応じて変調する光変調装置と、この光変調装置で変調された光を合成するプリズムとを備え、当該プリズムで合成された光を拡大投写して投写画像を形成するプロジェクタであって、請求項１ないし請求項６のいずれかに記載の光学部品を備えていることを特徴とするものである。この発明によれば、請求項１ないし請求項６のいずれかに記載の光学部品を用いてプロジェクタを構成することで、プリズムと固定ピンとの接着強度を十分に得ることができるとともに、プリズムを小型化できるプロジェクタが得られ、ひいては、プロジェクタの小型化が可能となる。

【００１７】請求項８に記載の発明は、請求項７に記載のプロジェクタにおいて、前記光変調装置に通電する電源を備えていることを特徴とするものである。この発明によれば、プロジェクタには光変調装置に通電する電源が設けられているため、光変調装置に容易に電気を供給できるようになる。

【００１８】

【発明の実施の形態】以下、本発明の一実施形態を図面に基づいて説明する。

〔１．プロジェクタの主な構成〕図１は、本実施形態に係るプロジェクタ１を上方から見た全体斜視図、図２は、プロジェクタ１を下方から見た全体斜視図、図３は、プロジェクタ１の内部を示す斜視図である。図１ないし図３において、プロジェクタ１は、略四角箱状の外装ケース２と、外装ケース２内に収容された電源ユニット３と、同じく外装ケース２内に配置された平面Ｌ字形の光学ユニット４とを備えている。

【００１９】外装ケース２は、図４に示すように、互いにネジ止めされる合成樹脂製のアッパーケース２１と、アルミニウム等の金属製のロアーケース２２と、同じくアルミニウム等の金属製のフロントケース２３とで構成されている。

【００２０】アッパーケース２１は、上面部２１１および背面部２１２が一体成形された形状である。上面部２１１の内部側には、アルミニウム板のパンチング加工による多孔状の第１電磁遮蔽部材２１３が取り外し可能に設けられている。アッパーケース２１の背面部２１２の内部側にも、アルミニウム板からなる第２電磁遮蔽部材２１４が設けられている。第２電磁遮蔽部材２１４は、ロアーケース２２側にネジ止めされている。

【００２１】ロアーケース２２は、底面部２２１および対向し合う一対の側面部２２２が一体に形成された形状であり、プレスやマシニングセンタ等で加工された所定形状のアルミニウム板等を曲げ加工することで、底面部２２１および側面部２２２が互いに折曲して形成されている。

【００２２】底面部２２１の前方の両隅部分には、プロジェクタ１全体の傾きを調整して投写画像の位置合わせを行う高さ位置調整機構７が設けられている。これに対して底面部２２１の後方側中央部には、樹脂製のフット部材６（図２）が嵌合しているのみである。

【００２３】フロントケース２３は、外装ケース２の前面部２３１を形成する部材であり、やはりプレスやマシニングセンタ等で加工された所定形状のアルミニウム板等の曲げ加工あるいは絞り加工によって形成されている。この フロントケース２３には投写レンズ４６に対応して丸孔開口２３２が設けられ、丸孔開口２３２の周辺は絞り加工によって内部側に湾曲している。

【００２４】このような外装ケース２には、内部に冷却空気を取り入れるための吸気口２Ａ，２Ｂ，２Ｃ、および内部から冷却空気を排出するための排気口２Ｄ，２Ｅの他、操作パネル２Ｆや、スピーカの位置に対応した多数の孔２Ｇ等が設けられている。また、外装ケース２の背面側には、インターフェース用の種々のコネクタが露出しており、各コネクタがマウントされるドライバーボードや他のボードは、背面側の開口部分を塞ぐように固定されたアルミ板５０に支持されるようになっている。このアルミ板５０は、電磁遮蔽板としても機能する。

【００２５】電源ユニット３は、外装ケース２（図３）内の前面側に配置された電源としての主電源３１と、主電源３１の後方に配置されたバラスト３２とで構成されている。主電源３１は、電源ケーブルを通して供給された電力をバラスト３２や図示しないドライバーボード等に供給するものであり、前記電源ケーブルが差し込まれるインレットコネクタ３３（図２）、周囲を囲むアルミニウム製のフレーム３４（図３）、図示しない電源回路等を備えている。また、主電源３１は、図示しないドライバーボードを介して後述する液晶パネル４４１に通電している。バラスト３２は、電力を主に光学ユニット４の光源ランプ４１１（図５）に供給するものであり、ランプ駆動回路を備えている。

【００２６】光学ユニット４は、図５に示すように、光源ランプ４１１から出射された光束を、光学的に処理して画像情報に対応した光学像を形成するユニットであり、インテグレータ照明光学系４１、色分離光学系４２、リレー光学系４３、電気光学装置４４、色合成光学系としての光学ガラス製のクロスダイクロイックプリズム４５、および投写光学系としての投写レンズ４６を備えている。

【００２７】〔２．光学系の詳細な構成〕図５において、インテグレータ照明光学系４１は、電気光学装置４４を構成する３枚の光変調装置としての液晶パネル４４１（色光毎に液晶パネル４４１Ｒ，４４１Ｇ，４４１Ｂと示す）の画像形成領域をほぼ均一に照明するための光学系であり、光源装置４１３と、ＵＶフィルタ４１８と、第１レンズアレイ４１４と、偏光変換素子４１５と、第２レンズアレイ４１６とを備えている。

【００２８】インテグレータ照明光学系４１を構成する光源装置４１３は、放射状の光線を出射する放射光源としての光源ランプ４１１と、この光源ランプ４１１から出射された放射光を反射するリフレクタ４１２とを有する。光源ランプ４１１としては、ハロゲンランプやメタルハライドランプ、または高圧水銀ランプが用いられることが多い。

【００２９】第１レンズアレイ４１４は、ほぼ矩形状の輪郭を有する小レンズ４１４Ａがマトリクス状に配列された構成を有している。各小レンズ４１４Ａは、光源ランプ４１１から出射されてＵＶフィルタ４１８を通る光束を、複数の部分光束に分割している。各小レンズ４１４Ａの輪郭形状は、液晶パネル４４１の画像形成領域の形状とほぼ相似形をなすように設定されている。たとえば、液晶パネル４４１の画像形成領域のアスペクト比（横と縦の寸法の比率）が４：３であるならば、各小レンズ４１４Ａのアスペクト比も４：３に設定する。第２レンズアレイ４１６は、第１レンズアレイ４１４とほぼ同様な構成を有しており、小レンズ４１６Ａがマトリクス状に配列された構成を有している。この第２レンズアレイ４１６は、第１レンズアレイ４１４からの光を集光している。

【００３０】偏光変換素子４１５は、第１レンズアレイ４１４と第２レンズアレイ４１６との間に配置されるとともに、第１レンズアレイ４１４からの光を１種類の偏光光に変換するものであり、これにより、電気光学装置４４での光の利用効率が高められている。具体的に、偏光変換素子４１５によって１種類の偏光光に変換された各部分光束は、集光レンズ４１７に集光し、最終的に電気光学装置４４の液晶パネル４４１Ｒ，４４１Ｇ，４４１Ｂ上にほぼ重畳される。偏光光を変調するタイプの液晶パネル４４１を用いた本実施形態のプロジェクタ１（電気光学装置４４）では、光を構成する２種類の偏光光（Ｓ波とＰ波）のうちの１種類の偏光光しか利用できないため、光源ランプ４１１からの光のほぼ半分が利用されない。そこで、偏光変換素子４１５を用いることにより、光源ランプ４１１からの出射光を全て１種類の偏光光に変換し、電気光学装置４４での光の利用効率を高めている。なお、このような偏光変換素子４１５は、たとえば特開平８－３０４７３９号公報に紹介されている。

【００３１】色分離光学系４２は、２枚のダイクロイックミラー４２１，４２２と、反射ミラー４２３とを備え、ダイクロイックミラー４２１、４２２によりインテグレータ照明光学系４１から射出された複数の部分光束を赤、緑、青の３色の色光に分離する機能を有している。

【００３２】リレー光学系４３は、入射側レンズ４３１、リレーレンズ４３３、および反射ミラー４３２、４３４を備え、色分離光学系４２で分離された色光、青色光を液晶パネル４４１Ｂまで導く機能を有している。

【００３３】電気光学装置４４は、３枚の液晶パネル４４１Ｒ，４４１Ｇ，４４１Ｂを備え、これらは、例えば、ポリシリコンＴＦＴをスイッチング素子として用いたものであり、各液晶パネル４４１Ｒ，４４１Ｇ，４４１Ｂの光出射面側には、光学フィルムとしての視角補償フィルム４１９が配置されている。色分離光学系４２で分離された各色光は、これら３枚の液晶パネル４４１Ｒ，４４１Ｇ，４４１Ｂによって、画像情報に応じて変調されて光学像を形成する。

【００３４】クロスダイクロイックプリズム４５は、３枚の液晶パネル４４１Ｒ，４４１Ｇ，４４１Ｂから射出された各色光ごとに変調された画像を合成してカラー画像を形成するものである。ここで、クロスダイクロイックプリズム４５は、光学的に必要最小限の大きさとされている。クロスダイクロイックプリズム４５には、赤色光を反射する誘電体多層膜と青色光を反射する誘電体多層膜とが、４つの直角プリズムの界面に沿って略Ｘ字状に形成され、これらの誘電体多層膜によって３つの色光が合成される。そして、クロスダイクロイックプリズム４５で合成されたカラー画像は、投写レンズ４６から射出され、スクリーン上に拡大投写される。なお、本発明の光学部品は、電気光学装置４４とクロスダイクロイックプリズム４５とを含んで構成されている。

【００３５】以上説明した各光学系４１～４５は、図６に示すように、合成樹脂製のライトガイド４７に収容されている。すなわち、このライトガイド４７には、光源装置４１３を覆う光源保護部４７１の他、前述の各光学部品４１４～４１８，４２１～４２３，４３１～４３４を上方からスライド式に嵌め込む溝部がそれぞれ設けられている。ここで、偏光変換素子４１５および第２レンズアレイ４１６は、一体にユニット化されて溝部に嵌め込まれている。そして、ライトガイド４７には、図３に示すカバー４８が取り付けられている。なお、本発明の光学部品である電気光学装置４４およびクロスダイクロイックプリズム４５のライトガイド４７への取り付けは後述する。

【００３６】また、ライトガイド４７の光出射側４９の一端側に液晶パネル４４１Ｒ，４４１Ｇ，４４１Ｂが一体に取り付けられたクロスダイクロイックプリズム４５が固定され、他端側の半円筒状部分に沿ったフランジ上に投写レンズ４６が固定されるようになっている。

【００３７】〔３．冷却構造〕図１ないし図３において、プロジェクタ１内には、投写レンズ４６脇および外装ケース２底面の吸気口２Ａから吸引された冷却空気が排気口２Ｄから排気される第１冷却系統Ａ、外装ケース２の側面に設けられた吸気口２Ｂから吸引された冷却空気が排気口２Ｅから排気される第２冷却系統Ｂ、外装ケース２の底面に設けられた吸気口２Ｃから吸引された冷却空気が排気口２Ｅから排気される第３冷却系統Ｃが形

成されている。

【００３８】第１冷却系統Ａでは、主電源３１の投写レンズ４６側に軸流吸気ファン５１（図３中に一点鎖線で図示）が設けられ、バラスト３２の光源装置４１３側に第１シロッコファン５２が設けられている。軸流吸気ファン５１によって投写レンズ４６脇および吸気口２Ａから吸引された冷却空気は、主電源３１およびバラスト３２を冷却しながらシロッコファン５２側に流れ、吸引される。第１シロッコファン５２から吐き出された冷却空気は、ライトガイド４７に設けられた吸気用切欠部４７１Ａから光源保護部４７１内に入り込んで光源装置４１３を後方から冷却し、排気用切欠部４７１Ｂ（図６）から排気され、最終的に排気口２Ｄから外装ケース２外に排気される。

【００３９】第２冷却系統Ｂでは、図７、図８の断面図に示すように、投写レンズ４６の下側に第２シロッコファン５３が設けられている。この第２シロッコファン５３は、吸気口２Ｂから電気光学装置４４の下方まで冷却空気を導くダクト部材６０（図６）の途中に配置されている。吸気口２Ｂから吸引された吸気は、ダクト部材６０に導かれて第２シロッコファン５３に吸い込まれ、外装ケース２の底面に沿って吐き出された後、電気光学装置４４を冷却する。この後に冷却空気は、光学ユニット４の上部に配置された図示しないドライバーボードを冷却しながら背面側の軸流排気ファン５４に向かい、この排気ファン５４で排気口２Ｅから排気される。

【００４０】第３冷却系統Ｃでは、図６中に一点鎖線で示すように、ライトガイド４７の下面における外装ケース２底面の吸気口２Ｃに対応した位置に第３シロッコファン５５が設けられている。吸気口２Ｃは、個々の孔を極力小径とすることで、プロジェクタ１の設置個所上にある塵や埃を吸い込み難くしている。吸気口２Ｃから第３シロッコファン５５に吸い込まれた冷却空気は、外装ケース２の底面およびライトガイド４７の下面間に形成されるダクト状部分を通って光源装置４１３側に吐き出された後、ライトガイド４７のインテグレータ照明光学系４１が配置された位置に対応して設けられた吸気用開口（図示せず）に導かれ、インテグレータ照明光学系４１を構成する前述した第１レンズアレイ４１４、偏光変換素子４１５と第２レンズアレイ４１６とからなるユニットのほか、ＵＶフィルタ４１８を下方から上方に向かって冷却する。この後に冷却空気は、カバー４８の排気用開口４８Ａおよび４８Ｂ（図３）から排気され、最終的に背面側の軸流排気ファン５４で排気口２Ｅから排気される。

【００４１】〔４．光学部品の構造〕電気光学装置４４とクロスダイクロイックプリズム４５とからなる光学部品において、図６および図９に示すように、電気光学装置４４は、クロスダイクロイックプリズム４５に支持され、このクロスダイクロイックプリズム４５は、当該クロスダイクロイックプリズム４５を支持する支持部材７０を介してライトガイド４７の光出射側４９（図７）に取り付けられている。支持部材７０は、クロスダイクロイックプリズム４５が載置される載置部７１と、この載置部７１をライトガイド４７の光出射側４９に案内および固定するための４つの案内固定部７２とを備えている。案内固定部７２は、載置部７１から側方へ突出して設けられており、この案内固定部７２とライトガイド４７の光出射側４９とが図示しないねじ等で固定されることでクロスダイクロイックプリズム４５がライトガイド４７の光出射側４９に取り付けられている。

【００４２】電気光学装置４４を構成する３枚の液晶パネル４４１Ｒ，４４１Ｇ，４４１Ｂは、図９および図１０に示すように、合成樹脂製の保持枠８１で保持され、クロスダイクロイックプリズム４５の光入射面となる３側面と対向配置されている。一方、クロスダイクロイックプリズム４５の光入射面となる３側面には、金属製の枠体８２が取り付けられており、保持枠８１と枠体８２とは、透明樹脂製の４つの固定ピン８３を介して連結固定されている。

【００４３】保持枠８１は、矩形枠状に形成され、液晶パネル４４１Ｒ，４４１Ｇ，４４１Ｂの周縁を保持している。また、保持枠８１の四隅には、図１１にも示すように、固定ピン８３が挿入されて固定される挿入孔８１Ａがそれぞれ設けられている。

【００４４】枠体８２は、図１０および図１１に示すように、上枠部８２Ａ、下枠部８２Ｂおよび２つの側枠部８２Ｃが一体に形成された矩形枠状とされ、板金の打ち抜き加工等で形成されている。各側枠部８２Ｃには、視角補償フィルム４１９を取り付けるためのフィルム取付部８２１が設けられている。このフィルム取付部８２１は、側枠部８２Ｃの途中を絞り加工することで電気光学装置４４側に突出して形成されており、視角補償フィルム４１９の面が固定される取付面８２１Ａを有している。取付面８２１Ａは、クロスダイクロイックプリズム４５の光入射面とほぼ平行とされ、視角補償フィルム４１９が２つの側枠部８２Ｃのフィルム取付部８２１に跨って取り付けられている。

【００４５】このような枠体８２は、視角補償フィルム４１９が取り付けられる側と反対側の面、すなわち上枠部８２Ａ、下枠部８２Ｂおよび側枠部８２Ｃの一部（フィルム取付部８２１以外の部分）がクロスダイクロイックプリズム４５の光入射面の周縁に接着剤等で固定される。固定された状態では、視角補償フィルム４１９がクロスダイクロイックプリズム４５の光入射面に対して空隙を介して対向配置される。ここにおいて、枠体８２の外周形状がクロスダイクロイックプリズム４５面よりも大きく形成されている。具体的に、図１０に示すように、上枠部８２Ａの幅寸法ａおよび下枠部８２Ｂの幅寸法ｂは側枠部８２Ｃの幅寸法ｃよりも大きく形成されて

おり、上枠部８２Ａはその大部分がクロスダイクロイックプリズム４５から上方に突出した状態で、下枠部８２Ｂはその大部分がクロスダイクロイックプリズム４５から下方に突出した状態で、クロスダイクロイックプリズム４５の光入射面に取り付けられている。このように上枠部８２Ａおよび下枠部８２Ｂをクロスダイクロイックプリズム４５の光入射面から突出した状態で設置し、この突出部分に固定ピン８３の後述する接着面８３３Ａを接着しているので、クロスダイクロイックプリズム４５の大きさに関係なく、枠体８２の突出部分を大きくすることで固定ピン８３との接着・固定面積が大きくとれるようになる。また、視角補償フィルム４１９を取り付けた際、視角補償フィルム４１９とクロスダイクロイックプリズム４５との間に形成される空隙により、視角補償フィルム４１９およびクロスダイクロイックプリズム４５間の通気性が確保される。

【００４６】固定ピン８３は、保持枠８１の挿入孔８１Ａに挿入される円柱形状の挿入部８３１と、この挿入部８３１の一端側に配置されかつ挿入時に外部に露出する角柱状の露出部８３２と、挿入部８３１の他端側に配置されかつ枠体８２に接着固定される接着部８３３とを含んで構成されている。このうち、接着部８３３は、枠体８２に接着固定される接着面８３３Ａを備え、この接着部８３３の断面積、つまり接着面８３３Ａの面積は、挿入部８３１の断面積よりも大きく形成されていてもよい。

【００４７】このような電気光学装置４４およびクロスダイクロイックプリズム４５からなる光学部品は、以下のようにして組み立てる。まず、保持枠８１に液晶パネル４４１Ｒ，４４１Ｇ，４４１Ｂを取り付け、クロスダイクロイックプリズム４５に枠体８２を取り付ける。そして、枠体８２のフィルム取付部８２１に接着剤等で視角補償フィルム４１９を取り付け、保持枠８１と枠体８２とを固定ピン８３で連結固定する。この際、固定ピン８３は、挿入部８３１および接着面８３３Ａに紫外線硬化型の接着剤を塗布した状態で、保持枠８１の挿入孔８１Ａに挿入されるとともに、接着面８３３Ａが枠体８２の四隅（前述した上枠部８２Ａおよび下枠部８２Ｂのクロスダイクロイックプリズム４５面からの突出部位）に当接される。クロスダイクロイックプリズム４５に対する液晶パネル４４１Ｒ，４４１Ｇ，４４１Ｂの位置を調整した後、固定ピン８３の露出部８３２側から紫外線を照射し、接着剤を硬化させる。これにより、液晶パネル４４１Ｒ，４４１Ｇ，４４１Ｂがクロスダイクロイックプリズム４５の光入射面側に固定される。

【００４８】上述のような本実施形態によれば、次のような効果がある。

（１）電気光学装置４４およびクロスダイクロイックプリズム４５からなる光学部品において、クロスダイクロイックプリズム４５には枠体８２が取り付けられ、この枠体８２に、液晶パネル４４１Ｒ，４４１Ｇ，４４１Ｂを保持する保持枠８１が固定ピン８３を介して取り付けられているので、固定ピン８３を直接クロスダイクロイックプリズム４５に固定しなくてすみ、固定ピン８３を固定するための面積をクロスダイクロイックプリズム４５自身に確保する必要がない。このため、光学的に必要最小限の大きさのクロスダイクロイックプリズム４５を使用でき、クロスダイクロイックプリズム４５自体を小さくできる。また、枠体８２の上枠部８２Ａおよび下枠部８２Ｂを側枠部８２Ｃよりも幅広に形成するとともに、上枠部８２Ａおよび下枠部８２Ｂをクロスダイクロイックプリズム４５の光入射面から突出した状態で設置し、この突出部分に固定ピン８３の後述する接着面８３３Ａを接着しているので、クロスダイクロイックプリズム４５の大きさに関係なく、枠体８２の突出部分を大きくすることで固定ピン８３との接着・固定面積を大きくできるようになる。このため、固定ピン８３と枠体８２との固定強度が十分に得られ、液晶パネル４４１Ｒ，４４１Ｇ，４４１Ｂをクロスダイクロイックプリズム４５側に確実に固定できる。

【００４９】（２）枠体８２において、上枠部８２Ａの幅寸法ａおよび下枠部８２Ｂの幅寸法ｂは、側枠部８２Ｃの幅寸法ｃよりも大きく形成されており、上枠部８２Ａおよび下枠部８２Ｂの大部分がクロスダイクロイックプリズム４５面からそれぞれ突出した状態とされているので、枠体８２がクロスダイクロイックプリズム４５の面をほとんど覆うことなく、かつ、クロスダイクロイックプリズム４５が小さくても固定ピン８３との接着・固定面積を大きくとることができる。これにより、固定ピン８３、つまり電気光学装置４４をクロスダイクロイックプリズム４５側に確実に固定できる。

【００５０】（３）プロジェクタ等の光学機器に一般的に用いられるプラスチック製の保持枠８１および光学ガラス製のクロスダイクロイックプリズム４５を使用しているので、経済的に構成できる。また、枠体８２を、板金の打ち抜き加工で形成しているので、枠体８２を所望の形状に容易に形成できる。さらに、本実施形態では、熱膨張率が合成樹脂とガラスとの間である金属製の枠体８２を介して、合成樹脂製の保持枠８１と、光学ガラス製のクロスダイクロイックプリズム４５とを連結しているから、プロジェクタ１の使用時に光源等から熱が生じても、枠体８２でクロスダイクロイックプリズム４５と保持枠８１との熱膨張の差にワンクッション入れられる。これにより、保持枠８１とクロスダイクロイックプリズム４５との熱膨張差による相対位置のずれを抑制できる。

【００５１】（４）枠体８２にはフィルム取付部８２１が設けられているので、視角補償フィルム４１９の枠体８２への取り付けを容易にできるとともに、視角補償フィルム４１９を液晶パネル４４１Ｒ，４４１Ｇ，４４１Ｂ

とクロスダイクロイックプリズム４５との間に容易に配置できる。

【００５２】(5)枠体８２のフィルム取付部８２１の取付面と、クロスダイクロイックプリズム４５の面との間には、空隙が形成されているから、視角補償フィルム４１９をクロスダイクロイックプリズム４５から所定間隔をあけて設置でき、視角補償フィルム４１９とクロスダイクロイックプリズム４５との間の通気性を良好にできる。

【００５３】(6)クロスダイクロイックプリズム４５側に接着固定される固定ピン８３の接着面８３３Ａを大きく形成することにより、固定ピン８３と枠体８２との接着強度をより大きくできる。

【００５４】(7)電気光学装置とクロスダイクロイックプリズムとからなる光学部品は、上述したような保持枠、枠体および固定ピンによって組み立てられ、本実施形態のプロジェクタ１は、当該光学部品を用いて構成されているから、クロスダイクロイックプリズム４５と固定ピン８３との接着強度を十分に得ることができるとともに、クロスダイクロイックプリズム４５を小型化できるプロジェクタ１が得られ、ひいてはプロジェクタ１を小型化できる。

【００５５】(8)プロジェクタ１には、液晶パネル４４１に通電する主電源３１が設けられているため、各液晶パネル４４１に容易に電気を供給できる。

【００５６】なお、本発明は前記実施形態に限定されるものではなく、本発明の目的を達成できる範囲での変形、改良は、本発明に含まれるものである。たとえば、前記実施形態では、固定ピン８３の接着面８３３Ａの面積が、挿入部８３１等の断面積とほぼ同じ大きさに形成されているが、本発明に係る固定ピンはこれに限定されるものではなく、図１２に示すような固定ピン８３Ａであってもよい。この固定ピン８３Ａは、その接着面８３３Ａの大きさが挿入部８３１や露出部８３２の断面積よりも大きくなっている。このような固定ピン８３Ａを用いれば、固定ピン８３Ａと枠体８２との接着面積を大きくすることができ、固定ピン８３Ａと枠体８２との接着強度を十分に確保できる。

【００５７】前記実施形態において、フィルム取付部８２１の取付面８２１Ａと、クロスダイクロイックプリズム４５の面との間には、所定間隔以上の空隙が形成されているが、このような空隙は必ずしも必要ではなく、通気の必要性に応じて、プリズムと光学フィルムとの間に適宜形成されればよい。

【００５８】前記実施形態では、光学フィルムとして視角補償フィルム４１９が設けられていたが、本発明に係る光学フィルムはこれに限定されるものでなく、電気光学装置およびプリズムからなる光学部品の用途に応じて、たとえば位相差板や偏光板等の種々の光学フィルムが設けられてもよい。

【００５９】前記実施形態では、枠体８２にフィルム取付部８２１が設けられていたが、設けられなくともよく、このような場合も本発明に含まれる。たとえば、上述した視角補償フィルム４１９のような光学フィルムが、液晶パネル４４１およびクロスダイクロイックプリズム４５間に配置されない場合には、枠体８２にフィルム取付部８２１を設ける必要はない。

【００６０】前記実施形態において、保持枠８１はプラスチックで形成され、クロスダイクロイックプリズム４５は光学ガラスで形成され、枠体８２は金属で形成されているが、これら保持枠、プリズムおよび枠体は、他の材料から形成されていてもよく、加工容易性、経済性等の様々な面から考えて適宜選択されてよい。

【００６１】前記実施形態では、３つの光変調装置を用いたプロジェクタの例のみを挙げたが、本発明は、１つの光変調装置のみを用いたプロジェクタ、２つの光変調装置を用いたプロジェクタ、あるいは、４つ以上の光変調装置を用いたプロジェクタにも適用可能である。また、前記実施形態では、光変調装置として液晶パネルを用いていたが、マイクロミラーを用いたデバイスなど、液晶以外の光変調装置を用いても良い。さらに、前記実施形態では、光入射面と光出射面とが異なる透過型の光変調装置を用いていたが、光入射面と光出射面とが同一となる反射型の光変調装置を用いても良い。さらにまた、前記実施形態では、スクリーンを観察する方向から投写を行なうフロントタイプのプロジェクタの例のみを挙げたが、本発明は、スクリーンを観察する方向とは反対側から投写を行なうリアタイプのプロジェクタにも適用可能である。

【００６２】

【発明の効果】本発明によれば、プリズムには枠体が取り付けられ、この枠体に、光変調装置を保持する保持枠が固定ピンを介して取り付けられているので、プリズムの面に固定ピンを固定するための面積を確保する必要がなく、プリズムの大きさを光学的に必要最小限の大きさとすることができる。また、固定ピンは、枠体に固定されるので、枠体の大きさや幅等を大きく設定すれば、固定ピンと枠体との固定面積を大きくとれ、光変調装置をプリズムに確実に固定できるという効果がある。

【図面の簡単な説明】

【図１】本発明の一本実施形態に係るプロジェクタを上方から見た全体斜視図である。

【図２】プロジェクタを下方から見た全体斜視図である。

【図３】プロジェクタの内部を示す斜視図である。

【図４】前記実施形態の外装ケースの分解斜視図である。

【図５】プロジェクタの各光学系を模式的に示す平面図である。

【図６】プロジェクタの光学ユニットの構成部材を示す

15

斜視図である。

【図７】図１の矢印VII－VIIから見た縦断面図である。

【図８】図１の矢印VIII－VIIIから見た縦断面図である。

【図９】前記実施形態の光学部品を示す斜視図である。

【図１０】光学部品を示す分解斜視図である。

【図１１】図９の矢印XI－XIから見た縦断面図である。

【図１２】本発明の変形例を示す図である。

【符号の説明】

１　プロジェクタ

16

３１　電源である主電源

４５　プリズムであるクロスダイクロイックプリズム

８１　保持枠

８２　枠体

８３　固定ピン

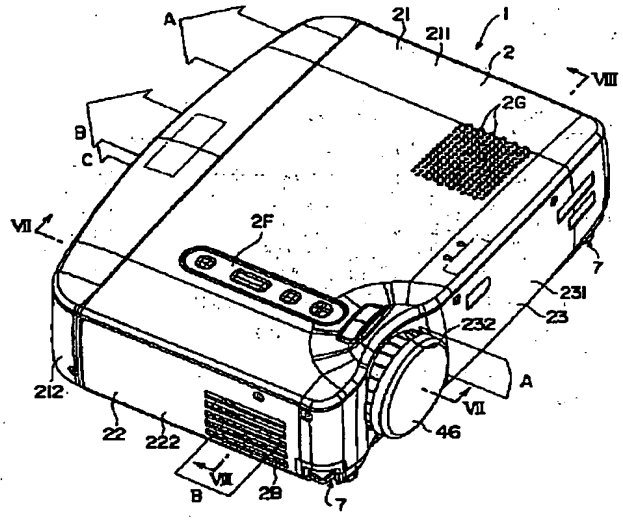
４１９　光学フィルムである視角補償フィルム

４４１，４４１Ｒ，４４１Ｇ，４４１Ｂ　光変調装置である液晶パネル

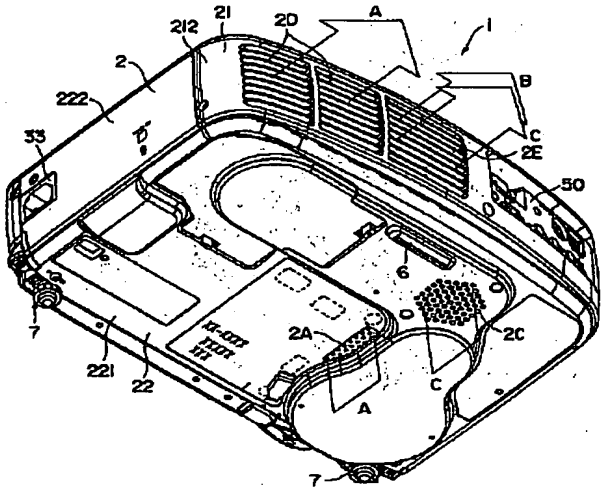
８２１　フィルム取付部

８２１Ａ　取付面

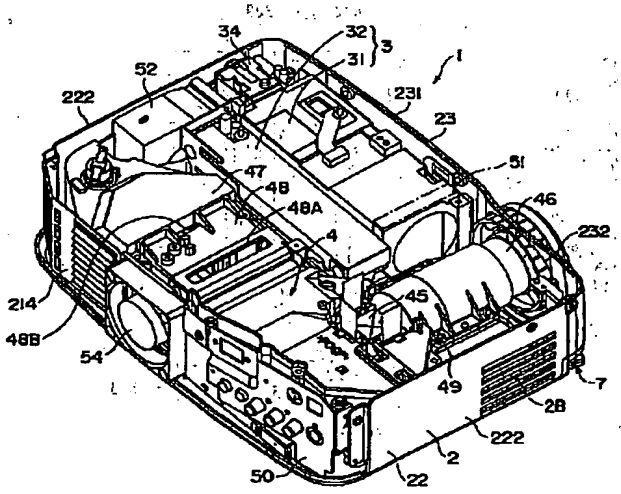
【図１】



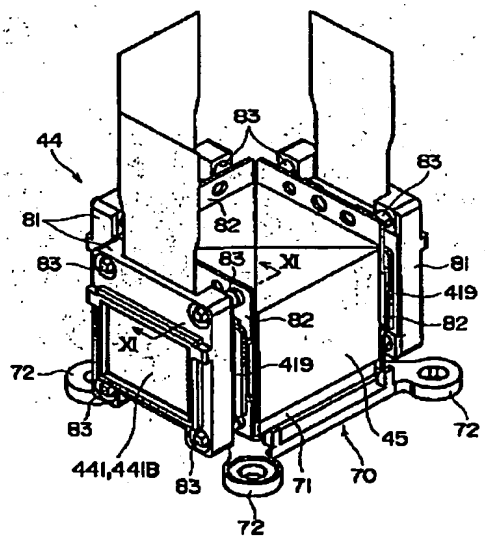
【図２】



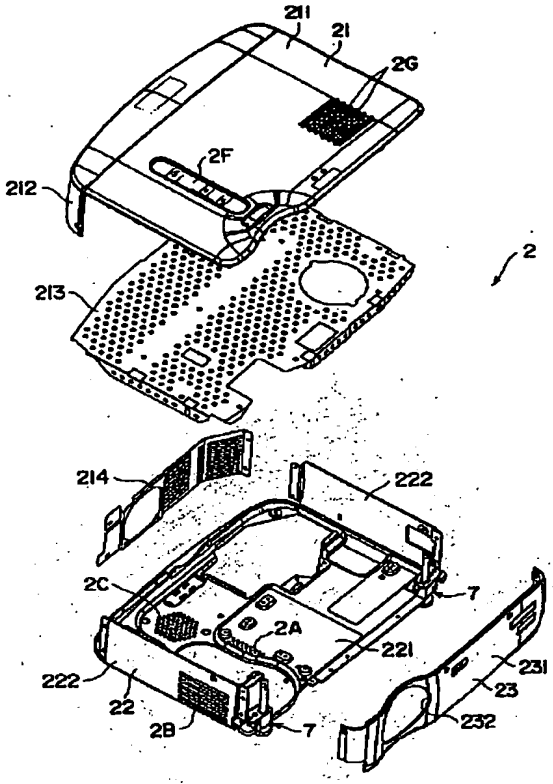
【図３】



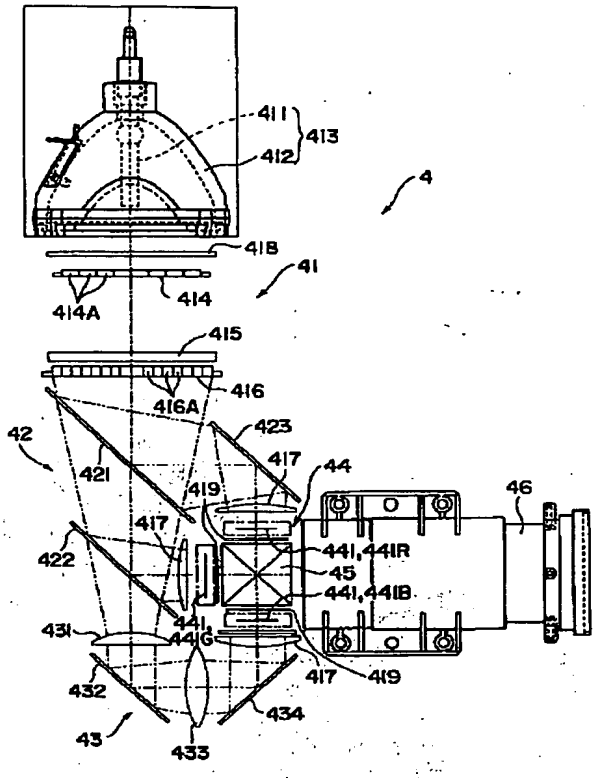
【図９】



【図４】


211
21
2G
2F
212
213
2
214
222
2C
7
2A
221
231
222
22
23
2B
7
232

【図５】


411
413
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416A
423
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44
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46
417
422
441,441R
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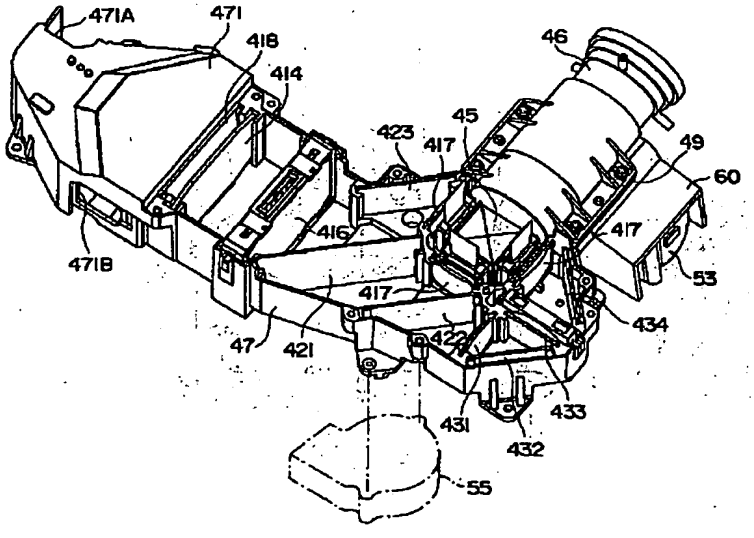
441,441B
431
441,
441G
417
419
432
434
43
433

【図６】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471B
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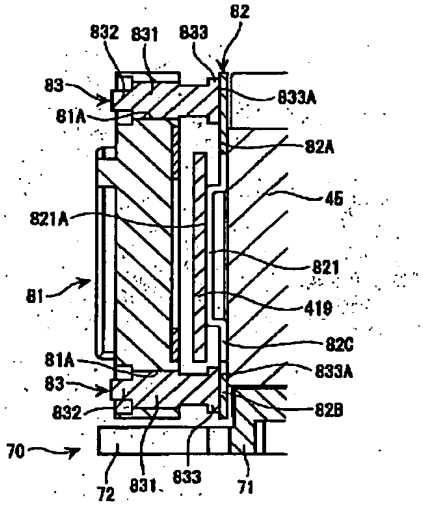
【図１１】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81A
82A
45
821A
821
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419
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81A
833A
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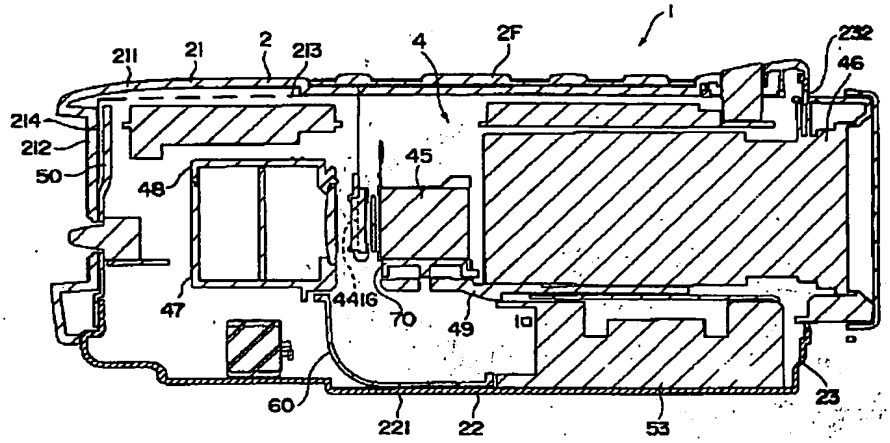
832
82B
70
72
831
833
71

【図７】


1
211
21
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213
4
2F
232
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214
212
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4416
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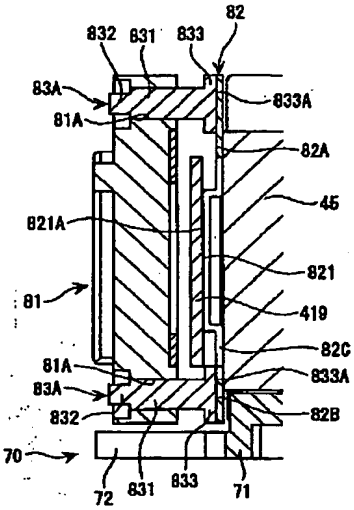
53

【図１２】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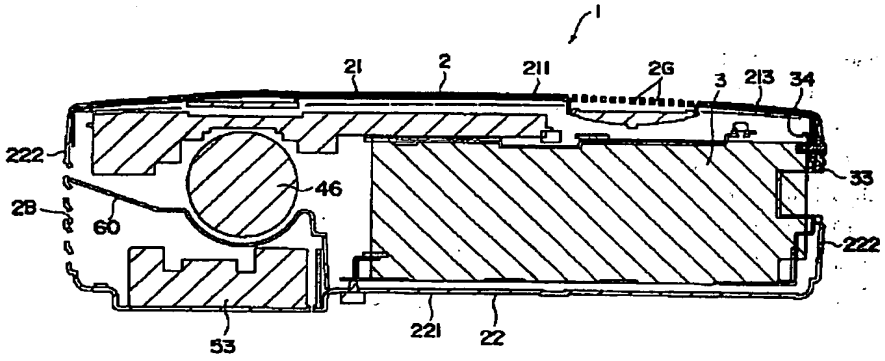
【図８】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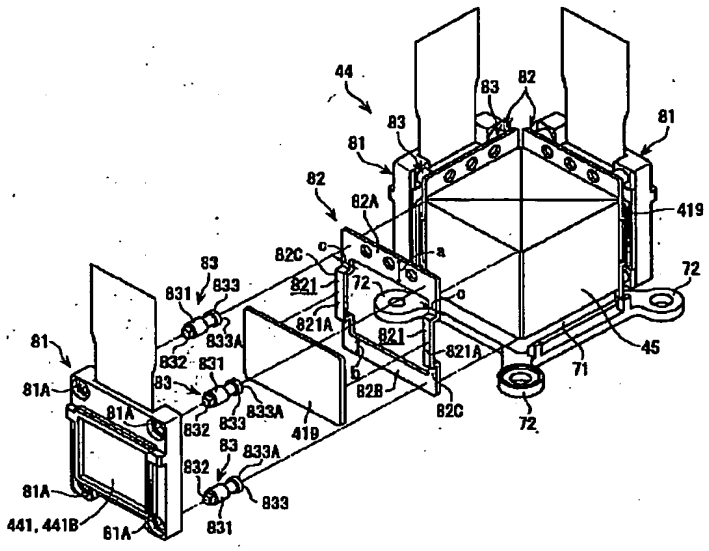
【図１０】



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Ｈ０４Ｎ	5/74			9/31	Ｃ
	9/31		Ｇ０２Ｂ	7/18	Ａ

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